THE SCIENCE OF PIANOFORTE TECHNIQUE

THOMAS FIELDEN

Professor of the Pianoforte, Royal College of Music

8/6

NET

BOOKS ON PIANOFORTE PLAYING AND TECHNIQUE

AGUILAR (E.), A little Book about Learning the Pf., cl., 2/6. 1866

ALLEN (I. S.), The Keyboard Explained, with Some Account of a System of Tonic Notation, 1/3.

ARNIM (A. L.), Complete Course of Wrist and Finger Gymnastics for Performers on Pf., Vn., etc., 29 *illus.*, cl., 7/6.

BARDAS (W.). Zur Psychologie der Klaviertechnik aus dem nachlass, 2/6. 1927

BECKER (H.), Piano Playing Hints, cl., 2/-

—— Mind, Muscle and Keyboard, 1/6.

BERNARD (E.), Essai pour le Methode Rationnelle du Jeu du Piano. 3/- *Modern, Paris*

BERNE, Vamping Made Easy, 1/-.

BLUME (M.), Theory with Relation to the Practice of Technical Studies, 1/6. 1889

BREE (M.), Die Grundlage der Methode Leschetizky, 4to, 3/-. *Mainz*, 1902

BREITHAUPT (R. M.), Die Naturliche Klaviertechnik, Vol. 1, Handbuch der Modernen Methodik und Spielpraxis fur Kunstler und Lehrer, Konservatorien und Institute, Seminare und Schulen, *musical and other illus.*, 674 pp., 8vo, cl. back, 10/- 1921

—— School of Weight-Touch, being Vol. 2 of Natural Piano Technic, *illus. and musical examples*, trans. Bernhoff, 100 pp., ob. fol., bds., 8/6.

—— Edition in the original German, ob. folio, bds., 5/-.

BROTHERHOOD (J.), The Development of the Hand for Piano Playing by Means of a Scientific Apparatus, The Technicon, 2/ 1886

BROWER (H.), Piano Mastery, Talks with Master Pianists and Teachers, and an Account of a Von Bulow Class, *ports.*, 299 pp., cl., 15/- (1915)

CONSEILS aux Jeunes Pianistes, 1/6. *Paris*, 1904

COOKE (J. F.), Great Pianists on Piano Playing, Study Conferences with Foremost Virtuosos, Paderewski, Hofmann, Pachmann, Rachmaninoff, Backhaus, Bauer, Grainger, etc., 418 pp., cl., 15/- 1917

CORTOT (A.), Principes Rationnels de la Technique Pianistique, 102 pp., 4to, 10/6. 1928

—— English Translation, 4to, 10/6.

COUPPEY, De l'Enseignement du Piano, cloth, 2/9. *Paris*, 1874

CURWEN (Mrs. J. S.), Psychology applied to Music Teaching, cl., 10/6.

—— Pianoforte Method, The Teacher's Guide, cl., 7/6.

DAVIES (W. H.), The Piano, a new method of acquiring complete control of the instrument by a system of muscular exercises, 2/6.

DAWSON (Frederick), The Pianoforte, 1/-.

DEBUYSERE (C.), Die Klavierdilettanten, 1/6. *Leipzig*, 1900

DICKS (E. A.), A Guide to the Practical Exams. for Teacher's Diplomas in Pf. Playing, cl., 2/6. 1915

DODD (F.), 48 Prog. Lessons in the Art of Piano Playing, Virgil method, cloth, 4/-.

EHRENFECHTER, Technical Study in the Art of Pianoforte Playing, cl., 3/6.

—— Delivery in the Art of Pf. Playing, cl., 3/-

EHRLICH, Wie ubt man am Klavier? Betrachtungen und Rathschlage von H. Ehrlich, 2/6. 1879

—— Celebrated Pianists of the Past and Present, 139 biographies, *with portraits*, 423 pp., cloth, 12/6. 1894

EISENBERG (J.), Natural Technics in Piano Mastery. From Student to Artist. 236 pp., cloth, 7/6; another copy, 5/6. 1930

ENGEL (C.), Pianists Hand-Book. A Guide for the Right Comprehension and Performance of our Best Pf. Music cl., 3/- 1853

—— Pianist's Handbook, a Guide for the Right Comprehension and Performance of our best Pf. Music. 217 pp., 3/6. 1856

EVANS (E.), How to Accompany at the Piano, cl., 5/-

FIELDEN (T., Prof. of Pf., Royal College of Music), The Science of Pf. Technique, 7 *plates and mus. examples*, 177 pp., 8vo, cl., 8/6. 1927

FILLMORE (J. C.), History of Pf. Music, 198 pp., cr. 8vo, cl., 4/6; another copy, 3/-

FISHER (H.), The Pianist's Mentor. *4th ed., enlarged*, cloth, 2/3.

FLAGNY (L. de), La Méthode de la Volonté. Renovation de l'enseignement Pianistique. 142 pp., 4to, 5/-. *Paris*, 1930

FOWLES, Centre Points in Pf. Study, 4/-.

FRISKIN (J.), Principles of Pf. Practice, 4/- 1921

GERMER (H.). Die Musikalische Ornamentik, 2/6. 1892

GERMER, Technics of Pf. Playing, with appendix, Musical Ornamentation, 4to, cloth, 4/-.

GLEN, How to Accompany, 3/-.

GOUDMAN (S.), Le Piano Mecanique, Ecuiels, Difficultes et Leurs Solutions en 9 Lecons d'Art Musical, 1/6. *Liege*, 1914

GRABILL (E. W.), The Mechanics of Piano Technique, cl., 4/- 1909

HAMBOURG (Mark), From Piano to Forte. A Thousand and One Notes. 311 pp., roy. 8vo, cloth, 18/6; another copy, 12/6. 1931

HAWKER (Lt.-Col. P.), Instructions for acquiring by means of Patent Hand-moulds the best position, with strength and articulation on the Pianoforte. 4to, 5/-. 1840

HOFMANN (J.), Piano Questions Answered, cl., 4/6. 1913

HORROCKS (C. R. H.), Student's Guide to the Art of Teaching the Pf., *numerous musical examples*, cl., 5/6.

HOW TO PLAY THE PIANOFORTE, by Lady Benedict, Arabella Goddard and others, cloth, 2/-.

HUNT (H. E.), Points on Practising, 2/6.

JACKSON'S Gymnastics for Fingers and Wrist, 37 *diagrams*, 99 pp., cl., 7/6. 1865

JOHNSTONE (J. A.), Art of Teaching Pf. Playing, Systematised Selection of Practical Suggestions, 256 pp., cl., 6/-; another copy, 4/-

—— Art of Expression in Pf. Playing, 2/-

—— Essentials in Pf. Playing and other Musical Studies, 243 pp., cl., 5/-

—— Rubato, or the Secret of Expression in Pf. Playing, 3/- 1920

—— Touch, Phrasing and Interpretation, cl., 4/6.

—— The Foundations of Technique, 2/6.

KNORR, Führer aus dem felde der Clavierunterrichts-Literatur Dritte auflage, 2/-

—— Methodischer Leitfaden fur Clavierlehrer, 2/- 1869

KNOTT, Pianoforte Fingering, 2/6.

KOHLER (L.), Fuhrer durch den Clavier-Unterricht, Ein Repertorium der Clavierliteratur, etc., als Wegweiser fur Lehrer und Schuler, 165 pp., cl., 2/9. 1894

KULLAK (Dr. A.), Die Aesthetik des Klavierspiels, 370 pp., 8vo, cl., 5/- *Berlin*, 1861

—— Die Asthetik des Klavierspiels, Siebente Auflage herausgegeben vor W. Niemann, 374 pp., 8vo (20/- net), 8/6. *Leipzig*, 1920

LESCHETIZKY METHOD (The), Being Experiences in the Technic and Execution of Pianoforte Playing according to the Principles of Prof. Leschetizky, with 100 Exercs., etc., by M. Prentner, 4to, bds., 7/6.

THE SCIENCE OF PIANOFORTE TECHNIQUE

MACMILLAN AND CO., LIMITED
LONDON · BOMBAY · CALCUTTA · MADRAS
MELBOURNE

THE MACMILLAN COMPANY
NEW YORK · BOSTON · CHICAGO
DALLAS · SAN FRANCISCO

THE MACMILLAN CO. OF CANADA, LTD.
TORONTO

THE SCIENCE OF PIANOFORTE TECHNIQUE

BY

THOMAS FIELDEN

PROFESSOR OF THE PIANOFORTE, ROYAL COLLEGE OF MUSIC

> "There are three things which a Pianist requires :
>
> The First is Technique
> The Second is *Technique*
> The Third is TECHNIQUE"
>
> *Von Bülow*

MACMILLAN AND CO., LIMITED
ST. MARTIN'S STREET, LONDON
1927

COPYRIGHT

PRINTED IN GREAT BRITAIN

TO

MARMADUKE BARTON

AND TO

THE MEMORY OF

HERBERT SHARPE

IN GRATITUDE FOR MUCH SOUND SENSE
AND FRIENDSHIP

PREFACE

This book has been designed as a scientific treatise. It is not intended to be put forward as a new method of technique, to be added to the many which have been written on this subject, although the student may find in it much that is new to him. It is an attempt to gather together the knowledge which has been accumulated hitherto not only by the teachers who have had methods of their own, and have written about them, but also by those who, like Brahms and Chopin, have given, in their compositions and studies, a clear guide to the observant student towards the attainment of a comprehensive technique. The rôle of the performers, too, is brought under consideration : so important is the value of observation of the great players, who, by their physical genius, seeming to depart from all the recognized rules of technique, have, often unconsciously, solved the problems which have exercised a whole generation of teachers.

The aim of the book is to prove that technique can be a purely natural, not an artificial matter, and that it can be achieved, not by mechanical grinding at finger and arm studies, but by the application of physical and mechanical laws to those studies. The way was paved twenty-five years ago by Matthay and Breithaupt. It will be necessary, in the course of examination of their methods, to criticize these masters, in some cases adversely : but the writer would be ungrateful, since he studied both these methods—the first with one of the ablest of its teachers, and the second with the master himself—if he omitted to acknowledge his debt to them. This book is an endeavour to carry on the great work of progress in pianoforte teaching which they so brilliantly inaugurated.

In Chapter III., the study of muscles and their actions is only a slight one. The subject is too exhaustive to be treated at length in a small work of this kind. The student who desires further information will do well to study Dr. Mackenzie's book, *The Action of Muscles*: and another equally fascinating book is Sir Arthur Keith's *The Engines of the Human Body.*

The author wishes to record his acknowledgment of the wise counsel and valuable help of his friend, Dr. F. C. Poynder.

CONTENTS

CHAPTER PAGE

I. METHODS OF TECHNIQUE - - - - - - 1

II. THE PHYSIOLOGICAL CONDITIONS IN THE DEVELOPMENT OF TECHNIQUE - - - - - 11

III. THE MUSCLES USED IN PIANOFORTE PLAYING - - 18

IV. TECHNICAL TRAINING BY GYMNASTICS - - - 34

V. THE ACT OF TOUCH - - - - - - - 45

VI. THE UNDULATORY WRIST MOVEMENT - - - 69

VII. THE RELAXATION FALLACIES. THE PSYCHOLOGY OF RESILIENCE - - - - - - - - 75

VIII. CONTRACTION AND FIXATION - - - - - 83

IX. THE ROTATION THEORY - - - - - - 89

X. THE FINGERS - - - - - - - - 96

XI. THE HIGHER DEVELOPMENT OF TECHNIQUE. VIBRATO 108

XII. GENERAL SUMMARY - - - - - - 123

XIII. SUGGESTIONS FOR TEACHING - - - - 132

XIV. THE PHILOSOPHY OF TECHNIQUE - - - 144

APPENDIX I. RHYTHM - - - - - - - 148

„ II. FINGERING - - - - - - - 151

„ III. SOME EXAMPLES FOR STUDY - - - 163

BIBLIOGRAPHY - - - - - - - - - 177

PLATES

FACE PAGE

I. Figs. 1 and 2 - - - - - - - - 20

II. Fig. 8 - - - - - - - - - - 38

III. Figs. 9 and 10 - - - - - - - 41

IV. Figs. 11 and 12 - - - - - - - - 42

V. Figs. 13 and 14 - - - - - - 62

VI. Fig. 15 - - - - - - - - - 63

VII. Fig. 16 - - - - - - - - - 105

CHAPTER I

METHODS OF TECHNIQUE

In tracing the history of pianoforte technique we have to consider first the instruments that were available to the early pianists. In the days of Bach and Handel, the mechanism of these instruments required the exercise of very little physical strength for their manipulation. The movement and weight of the fingers alone were sufficient. These circumstances gave rise to the system of writing finger exercises in order to develop the necessary technique for the music that was available at the time. In very little of the clavier music up to the time of Bach do we find the demand for any wrist work, least of all arm work ; indeed it is probable that when arm movement was required, as in lateral progression up or down the keyboard, the fingers acted as " tractors " to the arm, rather than the arm being the " pusher " to the fingers. While this method of technical training was suitable to the conditions, it was involuntarily the cause of much retardation of development when the nature of the instruments changed, and greater physical exertion was required. Modern thought has proved that the control of the fingers lies primarily in the big muscles of the arm, shoulder, and even of the body itself ; and therefore the process of development and control should begin from these points, and not from the opposite end. The instruments improved, but performers and teachers continued to base their technique on the old methods, with the result that a greater strain was thrown on the fingers than they were able to bear. Hence arose the ever-recurring problem of stiffness in the fingers and hands.

One of the principal fallacies, harboured even now by some modern teachers, was the idea that a strong blow of the fingers (keeping the arm still) could be achieved by finger strength alone. The failure to realize the laws of leverage, in that the fingers, however much the elimination of the arm was attempted, were bound to have a " fulcrum " to push against in response to the resistance of the keyboard, may be attributed to the fact that it never occurred to teachers of those days to study scientific laws in their application to technique ; although it is probable that they did give their attention to physiological laws in relation to the muscular movements of the fingers.

The failure to realize the function of weight, and the use of muscular power in support of that weight, as well as the value of the greater fulcrum of the elbow and shoulder, showed itself also when the exigencies of technique demanded the use of the wrist. The action of the wrist (flexing and extending) was taught *per se*, without any relation to the accessory function of the arm. It is true that players were taught to keep the elbow fixed : but this was more in order to isolate the action of the wrist from the upper arm than to use the elbow as a " fulcrum." This further led to greater stiffness in the forearm, since the muscles of the fingers (flexors and extensors) are in the forearm, as well as the wrist muscles.[1] The result was that it was found exceedingly difficult to secure clear muscular movements of the fingers and wrist except by the excessive exercise of strength ; in the exercise of suppleness and swiftness, the physiological conditions set up proved a very difficult barrier, only surmounted by those whose physical genius rose above these artificial conditions into the natural conditions. It was not properly realised that movement of the limbs is caused by muscles acting at a distance from those limbs. The moving parts were unable to function freely because they were trammelled by too much muscular contraction in themselves, which impeded free movement, and set up internal irritation, which in its turn caused cramp and stiffness.

So little had natural movements been observed, that even the great players like Liszt and Tausig taught the old method of still-hand exercises, stiff-wrist (forearm) exercises, etc., though they were seen to play differently from what they taught. It used to be said of Liszt, for instance, that he " shook octaves out of his sleeve," thus proving that he must have used the muscles of the upper arm (such proof can be tested by anyone who attempts such a " shaking " movement). Yet one of his most famous pupils advocated the stiffly held arm when practising the wrist exercise, going so far as to say that that was the *only* way to play octaves, and that it was so taught by Liszt himself ; and then even he, when asked to illustrate his theory by playing (presto) a scale of octaves, completely nullified his theory by " shaking " them with his arm in the Liszt way.

---

[1] On the use of the term "wrist-muscles," see Chapter III, p. 31.

Indeed the whole system of piano teaching was mechanical. Teachers found that by constantly practising exercises with the hand in a certain stereotyped position, they were able to attain a certain automatic action, a kind of false reflex action, which served them up to a certain point. Beyond that point only the great players progressed, and they only because they forgot almost all that they had been taught—not purposely, but because their power of imagination and inspiration conveyed itself to their physical movements as well as to their aesthetic expression : indeed their aesthetic expression was the result of their physical movements.

It should be remembered that the practice of mechanical exercises is not by any means wholly condemned. It is rather the lack of observation of physical movements—their inception and results—and the logical application of them to technical problems, which is under criticism.

The first of the great modern teachers to realize the drawbacks of the old system, and the value of freedom and suppleness, was Deppe, who is spoken of so enthusiastically in Miss Amy Fay's book, *Music Study in Germany.* This book should be read by all students of the pianoforte, if only for its lively and convincing demonstration of the fallacies of the old stiff-fingered methods, and its account of the hard road that lies before the serious student of technical problems.

Deppe taught his pupils to rest their fingers lightly *on the* *surface* of the keys, and then to exercise each finger separately without disturbing the keys with the others. Here was a vision of the truth that suppleness, not gymnastic strength, was the goal to aim at. In the Deppe wrist exercises the wrist was held loosely too, and the hand allowed to fall by its own weight on the keyboard. This also was a step in the right direction. The defect of the method lay in this that the system of resting the fingers on the keyboard, though it abolished the " gripping " of the keys by the non-operating fingers and so eliminated stiffness in that direction, merely shifted the stiffness to another part of the hand, viz. the part that kept the fingers still and prevented them from falling—the lifting (or extensor) muscles of the fingers.[1] Further, muscular power had to be exerted to keep the arm still, both in finger and wrist exercises: and this rigidity was jarringly disturbed when a forcible blow was given to the key, owing to the weight of the arm having to come in as a " fulcrum " (a factor which, as has been already stated, was as yet unobserved by teachers of the pianoforte).

Deppe grasped one important fact, which was developed by Leschetizky, his legitimate successor—the realization that the flexing and extending muscles of the fingers lay mainly in the forearm and not in the hand. Leschetizky taught his pupils to *imagine* the fingers as extending right up the arm, thus assisting in great measure to drive away the tendency to stiffness in the hand. If he had also taught them to imagine the ultimate resistance (the fulcrum) to lie in the arm as well, he would have arrived at a solution of the question which is only at the present day being understood. As it was, his method of inception of the movement of the fingers was a step in the right direction, but the ultimate point of contact caused stiffness, in the sense that too much resistance still occurred in the hand, and, in the finger exercises mentioned above, the non-operating fingers exerted a sort of passive resistance to the operating finger in their effort to prevent themselves from moving in sympathy with the operating ones.

---

[1] The attempt to strike the key with any one finger naturally caused the others to raise themselves in a kind of nervous re-action. Being prevented from flexing themselves (downwards) they naturally sought for some movement wherewith to balance themselves, in much the same way as a tight-rope walker balances with his arms. All this caused unnecessary disturbance and interference with freedom.

The ideas of Deppe and Leschetizky undoubtedly paved the way for the discoveries of Matthay and Breithaupt, who, curiously, were working contemporaneously, like Darwin and Wallace in another branch of science, towards the same goal.

Before entering upon an analysis of the methods of these two great men, mention ought to be made of a remarkable book which appeared before either of the two masters published theirs. This book was *The Balance of Arm in Pianoforte Playing* by W. Townsend, of Edinburgh. It is surprising that this book has not been more widely known: it must have been known in Germany, for Breithaupt himself acknowledged his indebtedness to it. In this book the author, though not developing his theme at sufficient length, pointed distinctly to the root of the question, in so far as he maintained the theory that the moving parts should be kept separate from the incepting source of power and impulse, thus enabling them to maintain their suppleness. He did not carry the idea of relaxation far enough, and it was left to the work of Matthay and Breithaupt to develop, each in their separate, often dissimilar, ways, the progress of this great solvent of stiffness in physical movement.

Breithaupt, in the preface to the second volume of his *Die Naturliche Klaviertechnik*, mentions the work of Steinhausen, a German physiologist, who wrote a book on the subject of the physiology of the arm in its application to pianoforte technique. Unfortunately this work has not been translated into English, although his work on the same science in its application to the bow-arm in violin-playing has been translated.

The foundation stone of the discoveries of the two masters was the use of the weight in the production of tone, and the use of relaxation both in producing that tone and in avoiding stiffness in the hands and arms. The methods of the two men were different. Matthay taught his pupils to use their weight in what might be called, for convenience, a passive movement, *i.e.* he produced his tone by relaxation of the muscles that braced up the different parts of the arm. For example, the weight of the arm when held out straight from the body at right angles to the ground is supported by the shoulder muscle in contraction; if this muscle is relaxed the arm falls, and the greater the speed of that fall, the bigger the tone.[1] This use of the shoulder muscle in suspending the weight of the arm takes all the strain away from the arm itself (and its component parts—the forearm, hand and fingers), enabling it to be held in a state of relaxation and suppleness. When, therefore, a finger strikes the key in this way, its condition is not that of strained muscular contraction preparing to encounter the resistance of the keyboard: it is nervously ready to do its selective duty of striking the key, and is *prepared* for resistance by the sense of the arm following up behind it to assist in meeting that resistance. This is a development of the Deppe idea of *imagining* the finger to extend throughout the length of the arm. Matthay carried his principle to the extent of using hand-weight, forearm-weight, and upper-arm-weight, securing variety of tone by these different degrees of weight and variations of their speed. In every movement he insisted on the necessity for keeping the hands and arms in a state of relaxation: it is true that he pointed out the necessity of there being a moment of rigidity at the point where the hammer reached the string, but he did not insist strongly enough on it, or rather he did not carry the argument out to a definite enough scientific conclusion, viz. that the weight of the arm meeting the "upward thrust of the mass" of the keyboard necessitated a fulcrum of resistance somewhere, and that this fulcrum was supported by the definite and strong, though momentary and resilient, *contraction* of the flexing muscles of the fingers, forearm, and upper-arm, and, if necessary, the pectoral and dorsal muscles in the body itself. So much stress was laid on relaxation that the necessity for contraction was too often overlooked. The result was that many of the followers of Matthay, according to the habit of most disciples of great men, copying the defects of his method rather than the qualities, misjudged the theory of relaxation and became flabby and untidy in their technique, with consequent indistinctness in details.

---

[1] This speed could be regulated in two ways: either by varying the height from which the falling arm could gather momentum, or by using muscular energy to impart that momentum.

A further defect that arose lay in the *uncontrolled* use of the weight; too much insistence on *complete* instead of gradual and *balanced* relaxation of the controlling muscles was the cause of this, and the result was often a hard tone: and this lack of balance was often responsible for much clumsy playing, in that there was not enough control of the groups of actions. The act of relaxation once committed, generally only one act of resistance occurred instead of a balanced distribution of several acts of resistance with the use of different "fulcra" in combination.[1] The distribution of weight over a group of notes in passage-work was certainly taught, but the source of control of that distribution, viz. the *gradual relaxation* of the suspending muscles and the proper realization of the distance of time between original contraction and final relaxation (*i.e.* from the beginning of the distributed passage to the end) were imperfectly understood and taught, if not entirely omitted.

Breithaupt differed from Matthay in the matter of inception of the act of relaxation, in so far as he insisted more on the necessity for *conscious* contraction before relaxation. Matthay must have known this, but he did not dwell strongly enough on its importance. Breithaupt's use of the weight might be called more *positive* than Matthay's, that is to say he went further back than the shoulder for his inception of movement, and laid greater stress on the idea of *throwing* the weight on to the keyboard, as opposed to the use of the passively falling weight. Energy was therefore greater in the Breithaupt method than in the Matthay one. Speaking broadly, the former was kinetic, and the latter static.

Matthay's maximum of tone was limited by the amount that could be obtained by weight and its speed from differing heights. He taught the system of applying muscular energy towards increasing the speed of the weight in order to obviate the necessity, for instance, of raising the arm high whenever a "ff" was needed: but not only was his point of inception less far back in the body than Breithaupt's, and therefore of less potential energy, but his impulse stopped practically at the point of inception; once the machinery was set in motion, the moving weight thus started was left to fall without further control. Breithaupt advocated the full physical control of the inceptive action, launching it on its way, as it were, with the result that the energy had more momentum, and the timing of the stroke was better.

---

[1] See exposition of theory, "The theory is . . . etc.," p. 128. See also illustration, p. 72, and musical illustrations *passim*.

Thus both men left a gap between inception of action and keyboard contact. Each held the idea of eliminating physical stiffness, and in this way each was reaching towards a nervous solution rather than a physical one. Matthay, in his use of the passively falling weight, left a larger gap between inception and contact than Breithaupt with his vigorous throwing of the weight-mass on to the keyboard. Both would have been ideal if they had advocated a *nervous* control right through to the point of contact. Matthay was perhaps nearer to the nervous solution, since Breithaupt in his vigorous inception was apt to prolong and exaggerate the physical action. This gap, unless it is under control, must leave some "blind spots"; it must obviously be under control if uncertainty and untidiness are to be avoided. It is this question of nervous control which has come to the front now, in the light of the knowledge of the theory that technique is ultimately mental, and it shows the way to a solution of all technical problems that beset the pianist.

Before leaving the discussion of the Matthay and Breithaupt methods, it is necessary to point out that neither of these men, Matthay less than Breithaupt, sufficiently emphasized the necessity for scientific knowledge of physiology, and the relations and co-ordinations of muscular actions; nor did they insist enough on a knowledge of the laws of mechanics, as far as the application of the laws of leverage was concerned. In the matter of physiology, the principal omission was the failure to grasp the fact that fingers, hands and arms move in co-ordination, and that *they must at the same time actively perform their own separate functions* within the movement of the whole arm, and not be merely props to support the action of its weight. Breithaupt did touch upon the matter in his chapter on the "Free oscillation of the fingers," but he only did it in a tentative way, feeling probably that the theory of weight application with relaxation would not hold if this were carried too far. If he had advocated a balanced and controlled fixation and ultimate relaxation, he would have realized at once how near to the natural physiological solution he was. It is obvious that if the finger is going to be a prop to a falling arm-weight, it cannot function in its individual character: nor will it be able to do this unless that falling weight is controlled by its own anchorage,[1] and the finger action "timed" to coincide with it.

Finally, Matthay laid too great a stress on the mechanism of the piano and not enough on the physiological preparation of the muscles for operating that mechanism; and both men in their dealing with physiological matters concentrated on the conditions preparatory to and up to the point of contact of the hammer with the string, omitting the greater importance of concentrating on the conditions *beyond* that point, a difference which will be obvious in the course of this book. The intention to *get past* the point of contact connotes very different physical conditions from those which only aim *at* the point of contact; and a true understanding of this difference may give a better idea of what relaxation really means. The discussion of the two methods just given is an attempt to define the limits to which they have progressed, and to open the way for the little more and how much it is that remains to be done.

It should be remembered that *destructive* criticism of these two masters and their methods is unthinkable. They have opened the road for thinkers in a way that none of their predecessors have done, and have revolutionized the ideas of teachers throughout the world; and their discoveries are of almost incalculable value. Matthay, indeed, more than Breithaupt, has forced teachers to think; he has made them observe the operation of the mechanism of the pianoforte, an important, but hitherto neglected, factor in the attainment of technique; and he has laid for ever the spectre of the deadly method of mechanical teaching and practice which existed up to his time. Their methods are now suffering from the complete volte-face which they caused in the hitherto accepted theories of technique, since, having abolished the old system of finger-training and meticulous attention to detailed *finger* work, the playing of their pupils necessarily lost in clearness and often in crispness, on account of the loss of the faculty of swift muscular contraction. Nevertheless, the wonderful results they have achieved are sufficient criterion of the value of their theories, and many of the best modern pianists are numbered among their pupils. At the same time, the fact must not be lost sight of that the great performers are not great solely on account of the method of their tuition : often they are so in spite of it ; we must judge a method by its results on the ordinary pupil, and these modern methods do not always come triumphantly through that test. The great performers are, as already stated, physical geniuses, laws unto themselves : the great methods are the result of continuous observation of their work : and we are arriving at a stage where it is being realized that these methods are based on purely natural movements, akin to the movements that take place in ordinary active life, in walking, running, cricket, tennis, or any other form of natural physical effort. A knowledge of muscular processes is desirable, and a deep study of the marvellous mechanism of the hands and arms : and the goal should be the mental and nervous control of all the movements of which these wonderful implements are capable.

---

[1] See footnote, p. 19.

By analyzing these natural movements, and applying the laws of physiology and, to a certain extent, the laws of mechanics, to them, we shall arrive at an even better solution of the problem of technique than we have already, and at the same time add to the foundation upon which future thinkers can build.

CHAPTER II

THE PHYSIOLOGICAL CONDITIONS IN THE DEVELOPMENT OF TECHNIQUE

There are three important factors to consider in the development of technique. They are, in the order of their use :

1. The Mental factor.
2. The Nervous factor.
3. The Muscular factor.

It is not necessary to train each one separately ; indeed, it is vital, since they react upon and co-ordinate with one another, to develop all three as far as possible at the same time. They are set down in this order so as to bring before the student the importance of consciously realizing the process that takes place in the exercise of any physical act. Briefly it is as follows :

The brain conceives the movement, the nerves communicate it to the muscles concerned in the movement, and they in their turn execute the orders, which they receive, to the best of their ability to function.

From this it will be seen how important the mental side is. Without a complete *mental* knowledge it is impossible to execute with certainty any given piece of music. It is conceivable that a prolonged mechanical practice of any passage may secure a certain automatic facility, and many players indulge in this method of practice : but there is always the element of uncertainty present, owing to the absence of mental direction. It is true, too, that continuous repetition may ultimately result in the physical movements becoming *reflex*, but there is a world of difference between uncontrolled and controlled reflex action. It should here be said that individual reflex actions can become so swift, and, ultimately, automatic, that the swiftest mind cannot control them, and they become involuntary. They can, however, be willed in detail slowly, and then controlled at speed by taking them in groups, and it is the control of these groups of reflex actions which makes for certainty in technique as well as swiftness. It is obvious, therefore, that in order to secure this control, the mind must be able to analyze the simple elementary movements which ultimately become parts of these groups of reflex actions. Further, if, instead of practising mechanical repetitions with the hope of sooner or later reaching the stage of reflex action, the mind be from the beginning concentrated on the nervous co-ordination and control of these repetitions, the stage, when reached, will not only be certain, but the process of reaching it will in the long run be shorter, since concentration will be active through the entire period.

Again, the mental side must be developed in the matter of knowledge of the muscular movements that are taking place in any given action of the arms and fingers. A player may be toiling at a technical difficulty, and through ignorance of the muscular conditions, be all the time drifting away from instead of approaching its solution. In a finger passage he may be straining and stiffening his *hand* in his effort to master the difficulty : if, instead of throwing the strain on his hands, he put it *in the region of the forearm where most of the finger muscles are situated*, he would more quickly and easily conquer it. The strain on the hand would be an impediment since it might be using muscles which in reality had nothing to do with the movement required. A knowledge of the location of the finger muscles would obviate the waste of time involved.

Here we approach a section of the much-discussed question of relaxation. Advocates of relaxation say, in effect, that the hand should be kept loose and supple in order to secure the best results : good results would certainly ensue in so far as relieving the strain on unwanted muscles would be concerned, but such results would not achieve their full value unless attention were concentrated on the muscles that *were* wanted, which ought to be functioning *vigorously*. If this is not done, the process of development is slow, and ultimately becomes reflex without control.

From observation of these points it will be seen that unless the music, and the processes by which it is executed, be mentally grasped, there is no hope of complete certainty in the performance of a difficult technical problem, such that it can be reproduced at any given moment. Herein lies the explanation of the inability of many players to perform a piece of music, or a series of pieces, without a special preliminary practice. (This does not apply to the "limbering-up" exercises, which most players indulge in as a preliminary to performance: this process is analogous to the stretching and swinging of the limbs preparatory to an athletic function like running. Even so, this process is as much a nervous one as a physical one, directed towards working up the co-ordination of brain and muscle.) There would not be so much necessity for this preliminary practice if pieces were studied mentally away from the instrument; and many great pianists have averred that they have done a very great deal towards the mastery of their pieces in this way, before playing them at all on the keyboard.

The nervous factor plays the part of directing and co-ordinating the muscles. In the performance of a play, it is not enough for the actors to know their parts perfectly: they have also to know where their parts interplay with the others, and they have to rehearse that part of their work until it becomes instinctive. The analogy applies here. The mind may have fully grasped the musical contents of the piece, and the muscles be quite fit to perform their part; but rehearsal is necessary in order to co-ordinate these factors, and train them to react swiftly and accurately, and, above all, independently; and it is in this matter that the nerves play their part. They are the means of communication from the brain to the muscles and need training and refining just as the muscles themselves do: and as their nature is to be swift in their operation, so they gain in swiftness by training.

One of the most important nervous functions is that of isolating muscular movements: independence of fingers, for instance, is gained not so much by muscular restraint of the non-operating fingers (which produces, indeed connotes, a form of stiffness) as by keeping away all nervous connection with those fingers, and concentrating the nervous impulses on the operating ones. It is obvious, for example, that holding down four fingers, and operating with one finger (as a technical exercise for independence of finger) must be wrong in principle, since the nerves of the holding-down fingers must be functioning vigorously, and very likely impeding the nerves of the moving finger, especially since the holding-down fingers are functioning in their flexing muscles, while the moving finger is functioning both in its flexing and extending muscles. Equally mistaken is the idea of holding fingers on the surface of the keys, because the same element of nervous complexity must arise, owing to the non-operating fingers having to be restrained to a similar degree, though in a different way.

The real solution lies in endeavouring to isolate *nervously* the operating finger, and to eliminate as much as possible all nervous communication with the others.

The corollary of all this, and it is one that every student should grasp from the beginning, is that nervous control connotes muscular control, and that a great deal of time spent in hard muscular exercises can be saved by the realization of this fact. We have only to look for an example to any form of physical speed for corroboration of this. A swift runner, for instance, does not devote his time to exercises for developing the muscles of his legs, nor (in another sphere) a swift speaker to exercises for developing the muscles of his tongue: the goal of each of them, and of any similar worker in the physical field, is *control*, not abnormal development. The writer has made the experiment of making his pupils who were unable to execute a trill, for instance, place their fingers passively on the surface of the keys, and, placing his own fingers on theirs, has executed a trill with them with little difficulty, thus proving that agility and suppleness were there, and that they only needed the requisite nervous stimulus in order to be able to master the difficulty themselves.

There is one other function which the nerves perform in the higher forms of technique. It is in that intensification of reflex actions which is generally known as "Vibrato." The trill is an example. From constant practice the fingers act in a reflex manner, and are set in motion by a nervous impulse which results in a kind of contraction not unlike muscular contraction.[1] The impulse once given, the fingers move by momentum, and the momentum can be renewed by a fresh impulse: the stronger the impulse the faster the movement. This, of course, needs practice just as all the other movements do: the important thing, in this as in any other branch of practice, is to *know* what is happening when the act is being performed, so that attention can be concentrated on the *right* practice. The playing of swift octave passages is another form of "Vibrato."[2]

The insistence on the importance of the *Nervous* side must not be allowed to obscure the importance of the *Muscular* side, which is responsible for the final execution of the original mental conception. One most important fact to be borne in mind is that the nerves cannot operate to their full efficiency unless the muscles are in good condition. Good condition of muscles does not mean development to an abnormal size, nor even to an abnormal strength: such abnormality is almost invariably liable to lead to the condition of being "muscle-bound." Good condition of muscles means the assurance to them of a proper supply of good blood, which enables them to respond to the swift nervous messages which the brain conveys to them. The importance of keeping the whole body in a sound and healthy condition will obviously contribute to success in this direction.

Great performers are spoken of as having "fingers of steel." If this means that they are of abnormal strength the description is wrong. So-called strength is not necessarily the result of muscular power: it is oftener the result of perfect timing and co-ordination of the muscles of the arms and body operating as a power and weight behind the fingers. In pianoforte playing the power of momentum operates in just the same way as in swinging a golf-club, or a tennis-racket, or a sledge-hammer. In all these three instances the original impetus starts from the *feet*, though this fact is not generally realized. If a lawn-tennis player, however great his strength of arm, attempted a fore-hand drive facing his opponent and with his feet close together, he could not get the degree of power into his stroke that would be possible to a less powerful player who placed his feet correctly and stood at right angles to the direction of his stroke. In the former case, there would be no momentum (or swing), but merely a "hit": in the latter there would not only be a hit, but all the swinging force of body movement behind it, and the speed of the blow would be considerably greater. This *speed* is the real motive force which produces power, and it is the power of exercising this speed which is present in the physical and especially in the nervous organism of those who are said to have "fingers of steel."

---

[1] The swiftness of muscular action, as well as its vigour, are dependent on nerve-power. In a test of swift re-action, such as responding to a command to shoot the arm out, if the message of the nerves be swift, the corresponding muscular action should be one of equivalent speed—the result of nervous energy. See p. 130.

[2] This and other problems arising out of this question will be dealt with in the chapter on the Higher Development of Technique.

This question of the right use of muscles will be developed in a later chapter. It is raised here in order to convince the student at the outset that the goal of muscular efficiency is not abnormality so much as fitness, nor strength so much as suppleness. Furthermore, suppleness must not be confused with flabbiness, nor should muscular suppleness be visualized without its concomitant of nervous suppleness. Muscular isolation is not so necessary as nervous isolation: indeed it may be said that *absolute* muscular isolation is almost impossible, because so many muscular movements are co-ordinative. For instance, the act of striking a chord on the pianoforte, while apparently a wrist or forearm stroke, is in reality a combination of shoulder, upper-arm, forearm, and hand: since the forearm, starting from above the keyboard, is lowered by means of the straightening of the arm by the triceps muscle, or the relaxation of the biceps muscle, in the upper-arm (which in its turn is suspended by the shoulder), and the muscles in the hand and arm assume fixation in order to support the blow delivered by the descending forearm : and further, the fingers are probably moving in the process from an *extending* position into a *flexing* position, the final goal being the fixation and re-action at the point of contact [1] of all the muscular movements which had been inaugurated in the mental conception and nervous inception of the muscular act.

Analysis and observation of this kind must be undertaken if the student is to arrive at certainty and permanence of control in technical problems. Before, however, attempting such analysis, a knowledge of the muscular structure of the arms and hands is desirable, in order that his observation should not be retarded by ignorance of what to look for. The next chapter will be devoted to this part of the subject.

The burden of the present chapter has been to impress upon the student the supreme necessity of continuous observation, during practice, of all the elements which contribute to the mastery of his technical problems. That so many fail to achieve mastery is due to the lack of attention to these elements, and to the habit of blind and unintelligent repetition of difficulties in the hope that they will in some magic way solve themselves. Therein lies ephemeral mastery, achieved and glimpsed at for a fleeting, ecstatic moment : but power and permanence come, as in everything, from patient, ruthlessly intelligent, and persistent endeavour, guided by scientific and exact knowledge, allied with the character, inspiration, and vision which make the true artist and seeker.

---

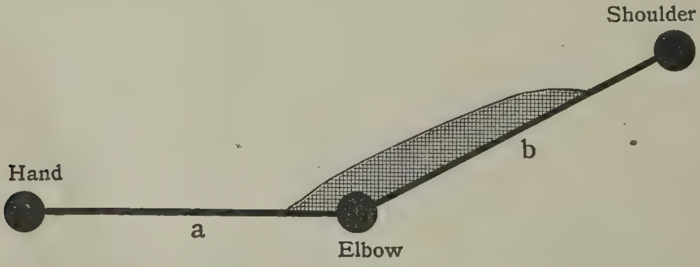
[1] See Chapter V.

CHAPTER III

THE MUSCLES USED IN PIANOFORTE PLAYING

Before going into the details of the various muscles which are used in pianoforte playing, a sketch of the processes of muscular action must be given. When we consider that the effort of playing the piano is mainly a muscular one, the ignorance of these processes is surprising; to quote Sir Arthur Keith:[1] "We take pains to understand the workings of a machine like a motor car or a steam-engine, and yet we ignore the usefulness, even necessity of the knowledge of the most wonderful machine of all—the human body."

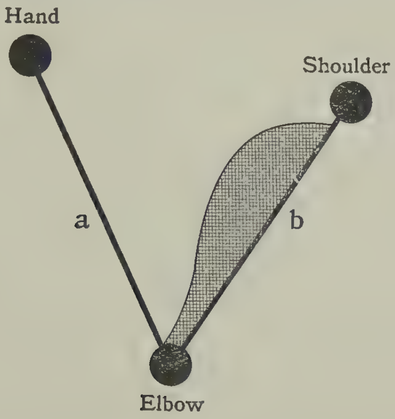
Muscles have two processes, contraction and relaxation, each process being capable of great variation in degree. The function of muscles is to move the bones of the limbs, enabling them to operate as levers. The following is a simple illustration of the muscular operation: in this example the brachialis muscle of the upper-arm is used:



(*a*) represents the forearm, (*b*) the upper-arm. The shaded portion is the brachialis muscle, fastened to the ulna-bone of the forearm and the humerus or upper-arm bone.[1] It is seen here in its elongated, relaxed state. In response to the necessary nervous impulse, this muscle can be made to shorten itself, or contract, with the result that it exercises a " pull " on the forearm which brings that limb upwards to an acute angle with the upper-arm.[2]

---

[1] *Engines of the Human Body.*



---

[1] See *The Action of Muscles*, by W. Colin Mackenzie. Dr. Mackenzie maintains that the brachialis (not the biceps, as is commonly supposed) is the main flexor of the elbow-joint. He goes further and asserts (*Op. cit.* p. 75) that the biceps does not flex the elbow, and his demonstration of the elongation of the biceps when the hand is pronated is almost convincing. With a natural hesitation to attempt to controvert so great an authority, the author nevertheless finds it difficult to accept entirely the theory of non-flexion. With a long experience in the practice of muscular isolation, he finds himself unable to relax the biceps when the elbow is flexed with the hand supinated. He prefers to believe that the biceps assists the brachialis in elbow-flexion.

Note: Supination is the turning of the forearm so that the palm of the hand is upwards: the opposite to this (with the palm downwards) is Pronation.

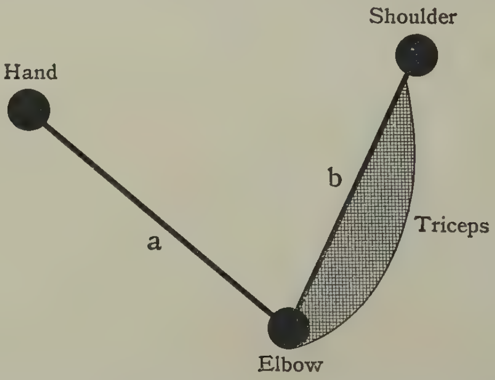
[2] An account of the properties of muscles may be useful.

A muscle is a mass of contractile tissue (which is popularly known as flesh) which is attached directly or indirectly at each end to bones. The attachment nearest the trunk, or nearest the middle line of the body, is called the " origin," and the other attachment is called the " insertion." In the case of the biceps muscle the origin is in the scapula, or shoulder bone, and the insertion is in the *radius* (one of the two bones of the forearm, the other bone being the *ulna*. The brachialis, the other upper-arm muscle, and the flexor when the hand is pronated, arises in the humerus and is inserted in the ulna). In muscular action, one of these ends is a fixed point, and the other is brought towards it. In lifting a weight with the forearm with the hand supinated, the fixed

The "bulging" of the muscle is due to its own contraction, and the forearm moves as a result of this contraction: the "bulge" is not the result—an idea strangely prevalent—of the movement of the forearm.

If the arm be held as in Fig. 1, the relaxation of this muscle will cause the forearm to drop to its original position; this action takes place, of course, as a result of the force of gravitation.

But if the arm be held as in Fig. 2, the act of relaxation will not restore the forearm to its original position, owing to the forearm not being in a position to drop: and therefore another muscle must be brought into play, in this case the triceps muscle, which can be plainly seen in Fig. 2. This muscle acts in the same way as in the brachialis illustration: it is attached above to the upper-arm and scapula, and is inserted below into the upper end of the ulna (one of the bones of the forearm): in contracting



---

point would be the origin of the biceps, and the insertion the movable point. On the other hand, in an action like raising the body on the arms (*e.g.* towards a horizontal bar) the forearm insertion is the fixed point, and the origin, or attachment to the scapula or humerus, as the case may be, is the movable one.

In both of these instances the "fulcrum" (See Chapter V, on "leverage") is at the lower end of the upper-arm bone (the humerus), *i.e.* in the elbow-joint. This is an instance of a lever of the third order. It is unnecessary here to go into the question of levers of different orders. For the purpose of description, however, the term "anchorage," constantly employed throughout this book, is used to indicate both the attachment of origin of the muscles which produce a given movement, and the fulcrum or bony surface on which a limb, large or small, swings when undergoing that movement.

PLATE I.

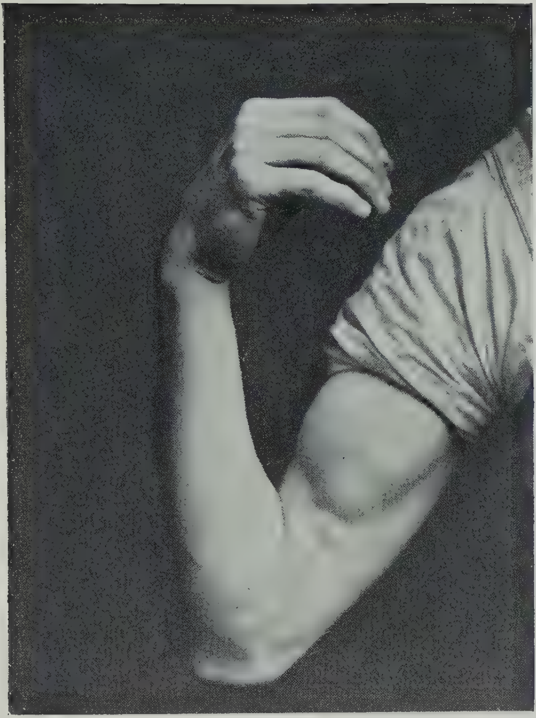


FIG. 1.

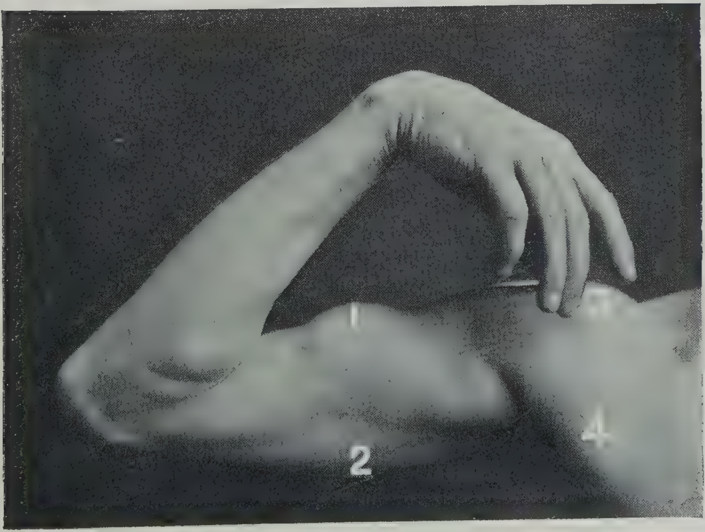


FIG. 2.

Showing : 1. Biceps and brachialis.
2. Triceps.
3. Deltoid.
4. Pectoral muscles.

it pulls the forearm from the bent position into the straight position.

The limbs can move of their own volition *only* by means of contraction: relaxation can do nothing in this matter, being merely, as its name implies, a relaxing, dismissing, process. The weight of the arm can be made use of in the process of relaxation, but only when the arm is placed in a certain position by muscular action. Even so, relaxation of (in this case) the brachialis muscle only enables the arm to fall by its own weight, and that at a speed determined by the action of gravity; the control of the movement, whether in the direction of retardation or acceleration, must be regulated by corresponding nervous and muscular action.

Muscular action is not only used to produce movement of bones (or limbs), but also to maintain those limbs in any position they may have assumed, by steadying them, and preventing movement. An example of this is given in Sir Arthur Keith's book. It is there shown in the movement of the muscles in the calf of the leg. These muscles control the movement of the foot on the ankle-joint, flexing, extending, and rotating it: they also serve to keep the ankle fixed when the foot has to support the weight of the body in walking, and prevent lateral deviation at the ankle-joint. If these muscles were unable to do this the weight of the body would overpower the strength of the ankle, and the walker would stumble, and probably fall down. This steadying power of the muscles is used in the hands and arms in pianoforte playing to hold them firmly when taking up the resistance at the moment of contact.[1]

Every movement of any limb is the result of the contraction of the muscles controlling that limb, and no voluntary movement can be made without such contraction. And arising out of this is the fact that there can be no relaxation unless there has previously been a contraction.

In the illustration given above of muscular action, it was shown that the muscles were fastened at each end to bones. A study of the function of these bones is a necessary factor in investigating muscular action.

---

[1] Moment of contact is later designated as "point of contact." See Chap. V.

The bones in action follow the general law of leverage, viz. that every lever must have a *fulcrum, or anchorage*,[1] on which to operate. The bones act in both these capacities. In the illustration given (of the action of the brachialis muscle) the bone of the upper-arm (humerus) is the anchorage, and the forearm forms the lever. In order that the forearm lever may operate freely, the upper-arm is necessarily fixed. If the latter were not fixed, the control of the forearm would be uncertain. In comparatively light movements of the forearm, the fixation of the upper-arm is sufficient to bear the strain of anchorage : but when the pressure of the leverage becomes too great for that fixation (*e.g.* in lifting a heavy weight), then extra fixation (by extra muscular assistance —in this case from the shoulder muscles) is necessary.

The action of the forearm in piano playing is a parallel case to that quoted from Sir Arthur Keith's book concerning the use of the calf-muscles in establishing rigidity. In this case the triceps muscle acts in extending the arm, the forearm being the lever, and the upper-arm being the anchorage ; the more vigorous the triceps action, the stronger must be the upper-arm fixation, and this is secured by the combined action of the biceps, brachialis and triceps, and also of the deltoid and pectoral muscles which extend from the shoulder bone. This fixation is exercised in two ways, as will be seen later ; it is necessary first as an anchorage from which the inceptive muscular movement is made, and secondly as a buffer against which the resistance of the leverage directs itself at the moment of contact.[2]

The same principles apply to the use of the whole arm, where the anchorage is at the shoulder.

Similarly, the bones at the lower extremity of the arm, those of the wrist and the matacarpal bones in the hand, act as anchorages to enable the fingers and hand to perform their function as levers: and they in their turn call on extra muscular exertion to secure rigidity according to the demands of the varying forces of leverage.

---

[1] See definition, p. 19, note.

[2] In this forearm movement, the fulcrum is at the elbow-joint (the lower end of the upper-arm bone, or humerus). This fulcrum is steadied by the fixation of the muscles mentioned. In referring to the elbow as the anchorage on which the forearm swings, this fulcrum and its fixation by the muscles controlling it are understood as part of that anchorage. See footnote, p. 19.

There remains the subject of tendons. These are "white, glistening, fibrous cords, varying in length and thickness, sometimes round, sometimes flattened, of considerable strength, and *devoid of extensibility*. They are connected, on the one hand, with the muscles: and, on the other hand, with the movable structures, such as the bones, cartilages, ligaments, and fibrous membranes."[1]

It is important to note that tendons are not to be confused with ligaments. The tendons join muscles to bones, but ligaments connect bones with bones. The tendons, as well as the ligaments, are pliant and flexible: the ligaments are "inextensile," but they are, on the other hand, liable to become less supple with lack of freedom of exercise. This neglect is often the cause of stiffness, and lack of power of stretch.[2] The tendons are merely connecting links between the muscles and bones. Their inextensibility is reasonable, and indeed inevitable: since any "play" would obviously impede the *immediate* response to muscular action; in an engine, for instance, a rubber cable or rope would be inefficient as a connecting rod, and a *rigid* metal one is necessary.

These facts have been given in order to enable the student to gain more profit from the examination of the diagrams than a mere, cursory glance would supply. Throughout this work will be found an insistence on the necessity for knowledge, not only of the structure of the limbs used in playing, but also of the functions of the different parts; the application of this knowledge establishes more firmly the foundations of technique, and considerably shortens its development.

---

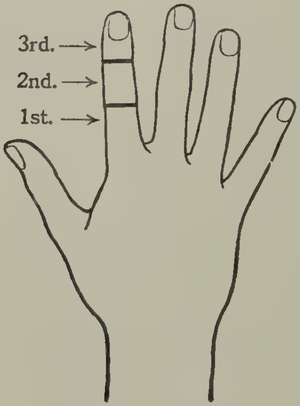
[1] Gray's *Anatomy*.

[2] The ignorance of this fact is the cause of much of the failure and disappointment in the effect to improve the stretch of the fingers. The ligaments can be improved and stretched only by constant and regular exercises in free movement; the exercises should be carried out by muscular action alone as far as possible, in order to encourage muscular strength: the use of apparatus is always to be deprecated, as causing strain and possibly inflammation, as well as discouraging the use of normal nervous impulse.

The bones of the arm and shoulder are given in the following list. The muscles attached to them are dealt with in the commentary which follows.

1. The scapula, or shoulder bone, and clavicle, or collar bone.
2. The humerus, or upper-arm bone.
3. The radius and ulna, forearm bones.
4. The carpus, or wrist, consisting of 8 small bones.
5. The metacarpal bones (in the hand).
6. The phalanges (in the fingers).

The accompanying sketch shows the numbers of the phalanges.



The scapula and clavicle are the anchorages for the shoulder muscles. These are :

1. The Deltoid, which lifts the whole arm up to the horizontal position.

2. The pectoral muscles, which swing it laterally inwards and forwards. The pectoralis minor, however, arises in the ribs.

3. The dorsal muscles, on the back of the shoulder (the scapula and clavicle bones assist here as anchorages) which swing the arm laterally outwards and backwards.

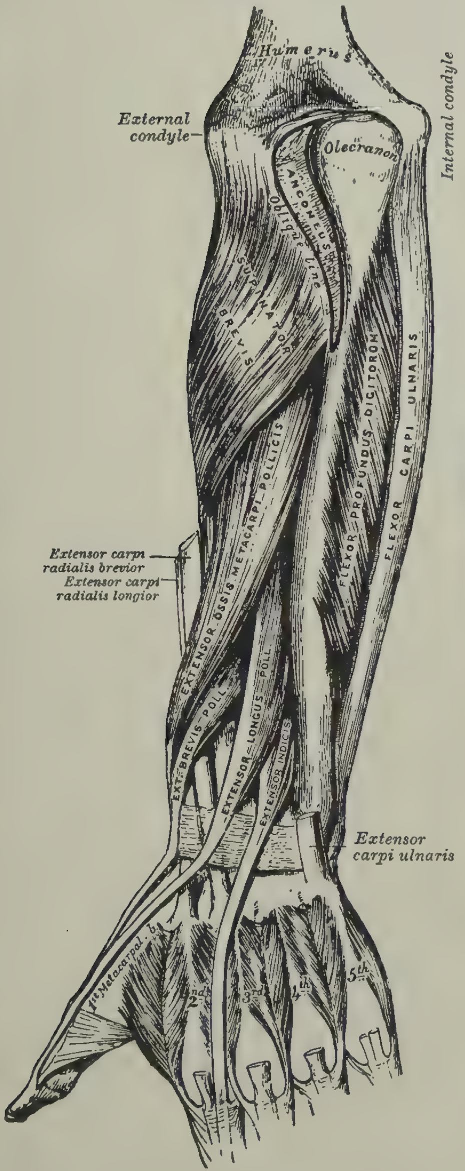


FIG. 3.—Back of the forearm: deep muscles.

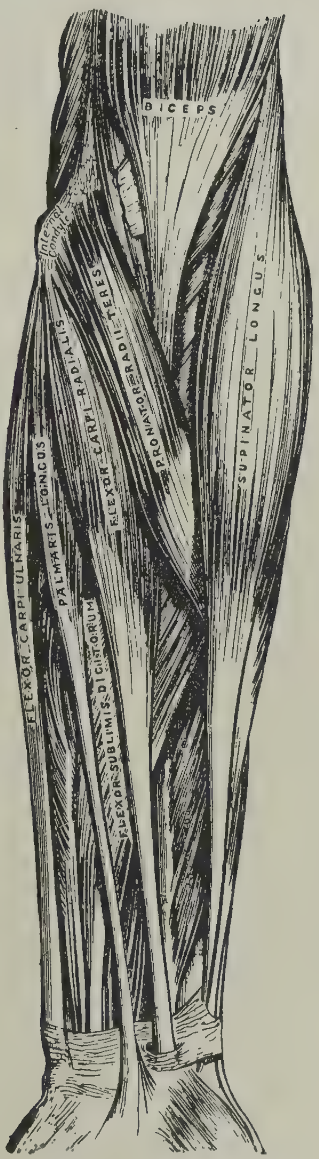


FIG. 4.—Front of the left forearm: superficial muscles.

After Gray's *Anatomy* (by permission of Messrs. Longmans, Green & Co., Ltd.).

The pectoral and dorsal muscles act in pulling the arm down again from the horizontal.[1]

The scapula is also the origin of attachment of the biceps[2] and part of the triceps.

The humerus is the anchorage for the brachialis (which flexes the forearm) and the triceps (which extends it again). The biceps assists in flexing the forearm: "It is, too, a powerful supinator. The biceps also serves to render tense the deep fascia of the forearm by means of the broad aponeurosis given off from its tendon."[3]

The lower end of the humerus (the internal and external condyles) (Fig. 3) serve, with the radius and the ulna, as anchorages for the wrist, hand, and finger muscles. The radius is a movable bone: it rotates on the ulna (the bone on the little finger side of the forearm) by means of the pronating and supinating muscles in the forearm. (Fig. 4.)

The carpus is the wrist. It includes the 8 small bones which form the wrist, and lie between the two forearm bones on the one hand, and the metacarpal bones on the other. The wrist-joint is the actual joint by which the radius articulates with two of the small carpal bones.

---

[1] These are general names, representing *groups* of muscles. An illustration of detail may be given: "If the arm has been raised by the Deltoid, the Pectoralis major will, conjointly with the Latissimus dorsi and Teres major, depress it to the side of the chest. If acting alone, it adducts and draws forward the arm, bringing it across the front of the chest, and at the same time rotates it inwards" (Gray's *Anatomy*, p. 355). Detail of this kind is not vital to our purpose. It is sufficient to point out the general situation of the groups of muscles: the interplay of the individual ones is so complicated and involved that it is impossible to say where the operation of one muscle ends and the other begins: nor is it necessary, since in piano-playing the question of the isolation of muscular movements deals with groups rather than with individuals: or if isolation is necessary, as in the case of the fingers, the process is nervous rather than muscular. Furthermore, it is only in the process of *training*, not in actual playing (in the finished state), that analysis is necessary: by the time the period of achievement will have been reached, the muscular action will have passed through the introspective stage into that of the subconscious and reflex

[2] The insertion of the biceps to the forearm can be clearly seen in Fig. 4.

[3] Gray's *Anatomy*. The deep fascia is a thick, almost rigid membrane, which forms a sheath for the muscles, giving a broad surface for their attachment. The deep fascia assist the muscles in their action by the degree of tension and pressure upon their surface, and this tension can often be increased by muscular action, as in the case of the biceps here mentioned. It is this property of the muscular structure which is of such great use in the practice of Vibrato. An experiment can be made in playing swift octaves: it will be observed that the biceps is strongly contracted in this action, although it is apparently a wrist and forearm function. This is due to the action of the biceps in assisting the tension of the muscles in the forearm. This is a fundamental factor in the use and theory of Vibrato. See Chapter IX.

The group of muscles: Flexor carpi radialis, Flexor carpi ulnaris, Extensor carpi radialis, Extensor carpi ulnaris,[1] act in flexing or extending the wrist, as their names imply, towards the radial or ulnar side. They also assist in rotating the hand on the wrist (in the action which is known as circumduction). With the exception of the *flexor carpi ulnaris*, which is inserted into one of the wrist bones, they are inserted into the metacarpal bones of the hand.

The metacarpal bones form the anchorages for the interossei muscles, which abduct and adduct the fingers; the interossei muscles also assist in extending the fingers.

The lumbricales[2] (which flex the first phalanges[3] of the fingers) arise from the tendons in the hand.

The interossei are in two layers, palmar and dorsal. The palmar ones adduct the fingers towards an imaginary line drawn through the centre of the middle finger: the dorsal ones abduct them away from that line.

The following general summary of all these details should be studied, in conjunction with an examination of the anatomical diagrams:

1. All muscles have reciprocating muscles: flexors reciprocate extensors, and *vice versa*. This applies also to groups of muscles.

2. The muscles operating any limb (or lever) are at a distance from the levers, *e.g.*:

   (*a*) The biceps, brachialis and triceps, operating the forearm, are situated in the upper-arm.

   (*b*) Flexors and extensors, operating the hand and fingers (see 3), are in the forearm.

   (*c*) Lumbricales and interossei, operating the fingers, are in the hand.

3. Arising out of 2 (*b*) and 2 (*c*). The lumbricales flex the first phalanges of the fingers, and the flexors (flexor profundus digitorum) flex the 2nd and 3rd phalanges. In extension,

---

[1] Figs. 4 and 5.

[2] See Fig. 6.

[3] See diagram, p. 24.

the reverse takes place, the extensors (extensor communis digitorum) extending the 1st phalanges, and the interossei the 2nd and 3rd.[1]

4. The superficial muscles on the front of the forearm practically correspond to the deep muscles on the back of the forearm, and *vice versa.* For instance, the main flexing muscle of the fingers, the flexor profundus digitorum, a deep muscle,[2] corresponds to the extensor communis digitorum, a superficial muscle.

5. While the extensor communis digitorum sends tendons to all four fingers, the index and little fingers have tendons of their own as well.[3] While that of the index finger merges into the main extensor communis digitorum, that of the little finger, while it is generally joined to the common tendon by a thin tendinous slip, runs through a separate compartment in the ligament where the radius joins the ulna just above the wrist-joint. This independent structure of these two fingers enables them to be extended (pointed) while the others remain flexed. In action (of extension) the extensor communis digitorum tends to open out the fingers laterally. The exercise in the next chapter (Finger Exercise 1 (*b*)) allows for this.

6. The 4th (ring) finger has cross ligaments on either side of its tendons which serve to support the metacarpal bones of the hand : were these tendon slips wanting it is likely that the palmar muscles of the hand would be weakened in their anchorage. This cross tendon formation is also necessary in order to join up with the separate tendon of the little finger. The supposed weakness of this (4th) finger is thought to be due to this apparent irregularity. Recognition of this peculiarity of structure, and of the necessity for special treatment in developing the strength of this finger, will overcome the weakness. The finger should be exercised gymnastically (see exercise for this purpose, Chapter IV), and, at the keyboard, *it should never be exercised with* both *adjacent fingers held down.*[4]

---

[1] The Interossei in adducting are palmar, or in the palm of the hand : the abductor interossei are dorsal, or in the back of the hand. The former are plainly seen in Fig. 6, the latter in Fig. 3.

[2] See Fig. 7.

[3] See Fig. 5.

[4] While admitting the physical disability of the 4th finger, it will be agreed that the weakness is intensified by pandering to it. Especially is this the case

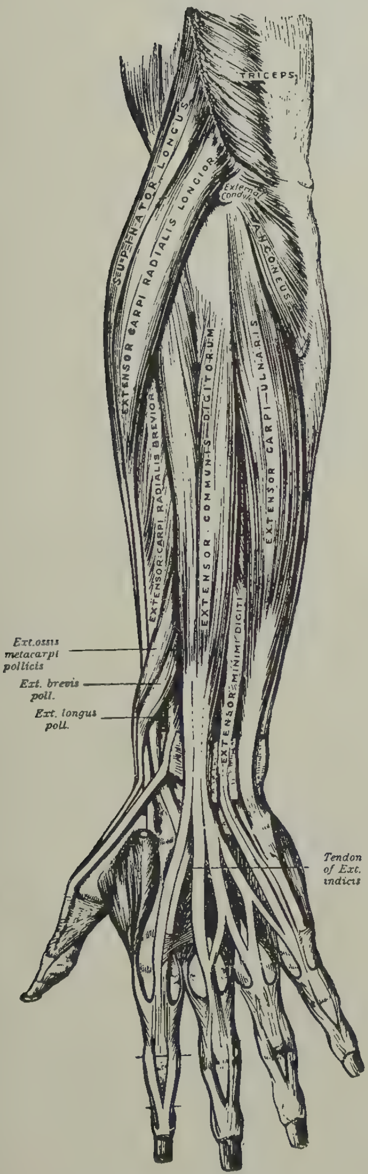


Fig. 5.—Back of left hand and forearm: superficial muscles.

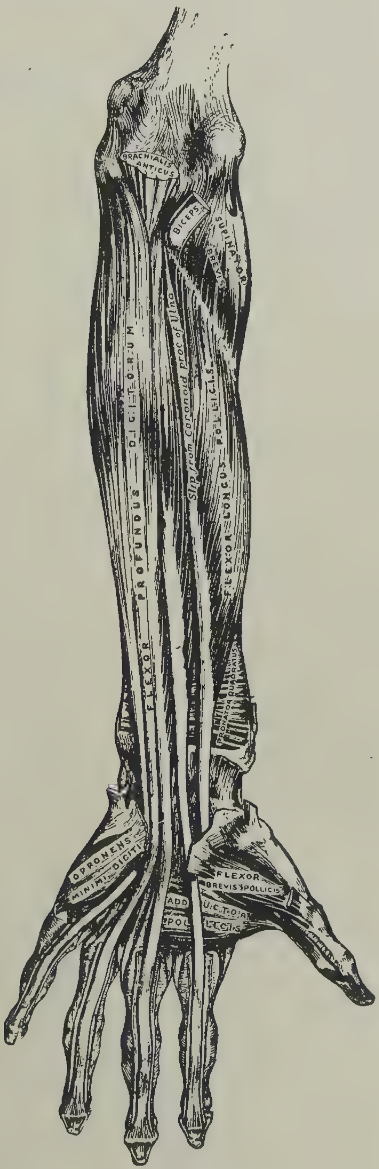


Fig. 7.—Front of left forearm and palm of left hand.

After Gray's *Anatomy* (by permission of Messrs. Longmans, Green & Co., Ltd.).

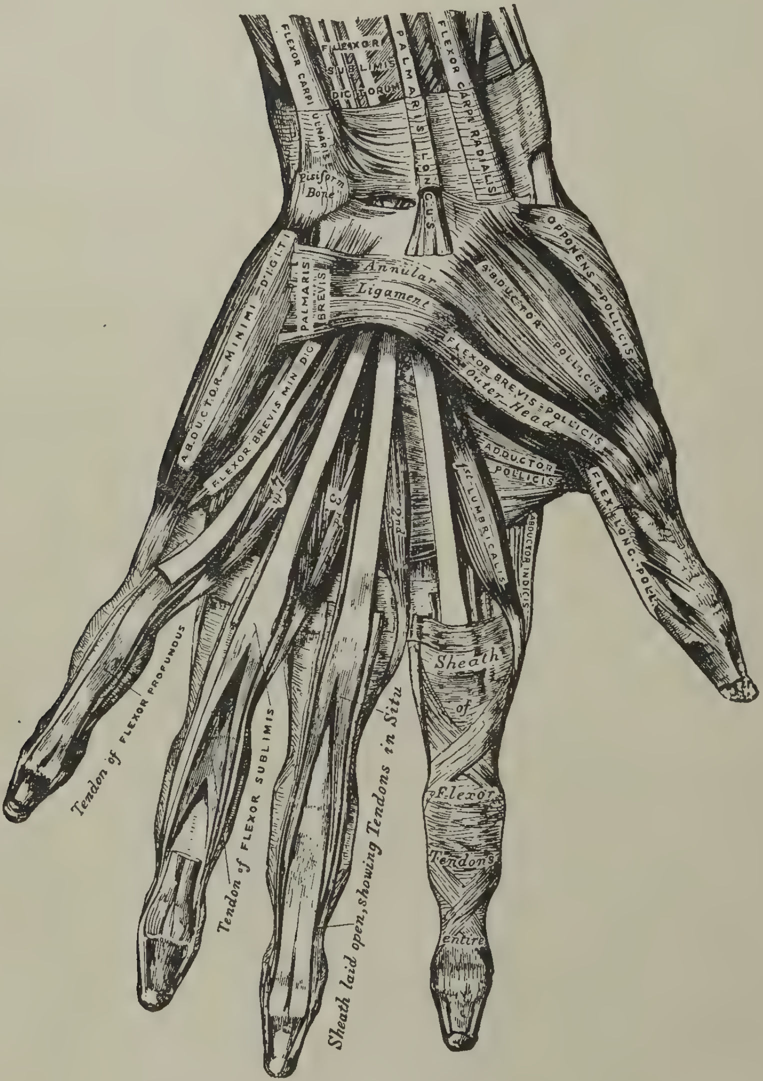


Fig. 6.—Muscles of left hand: Palmar surface.
After Gray's *Anatomy* (by permission of Messrs. Longmans, Green & Co., Ltd.).

There are two important and interdependent factors to be considered before leaving the subject.

The first is that muscles, when their own particular function is fulfilled, can be, and often are, used to assist the work of the greater muscles. For instance, the flexing muscles of the fingers, when the fingers have been flexed to their limit, go on to assist in flexing the wrist and forearm.

Again, the flexor muscle of the thumb (the flexor longus pollicis,[1] which extends along the radial side of the forearm) will, if the thumb be fixed, assist in flexing the wrist: the same may be said of the opponens minimi digiti,[2] the muscle which assists in flexing the little finger. This is a very important point indeed, where the playing of wrist-staccato octaves is concerned. For in this action these muscles are constantly in play. If the thumb and little finger be fixed, these muscles will be able to assist in moving the wrist: but if the thumb and little finger be moved about independently of the wrist action, then these muscles are performing complicated and non-coordinated operations, with consequent irritation and fatigue. Kullak realized this point, probably unconsciously, when he insisted that the chief difficulty of playing octaves lay in the proper control of the thumb.[3] This point clears up two fallacies: (1) that the hand must ever be fixed, and (2) that there is no such thing as wrist action.

We may here also dismiss, as of no importance, the question of whether it is correct to speak of wrist-staccato or hand-staccato. Those who have raised this question assert that the wrist is only a joint or hinge. This is by no means a clear or even accurate statement: and even so, most reasonable people understand what is meant by wrist-staccato. To call it hand-staccato is merely pedantic. On the other hand, to maintain, as Breithaupt does,[4] that there is no such thing as wrist action, is mere idleness.

---

in chord playing, where the student too often prefers the 3rd finger, even though it involves a pronounced stretching, to the 4th. In consequence, the 4th suffers as much from disuse as from inherent weakness.

[1] See Fig. 7.

[2] *Ibid.*

[3] He should have mentioned the little finger as well.

[4] *School of Weight-Technique*, Vol. II.

This question of the interaction of muscles must be taken into account when using the parts of the arm in combination. For example, if the forearm is to be used *directly*, it is clear that the hand must be rigid and "of a piece" with the forearm, at least at the moment of contact: otherwise the hand operates independently and in a non-co-ordinated fashion. This, of course, means that the hand should be fixed at the moment of contact, not necessarily before it, although in many cases the preliminary fixation of the hand helps enormously in the crispness and speed of attack.[1]

The other point to be regarded is that a muscle may have its anchorage at either end of its length. In climbing a rope, for example, the forearm is a relatively fixed point, and the biceps (the hand being supinated) exercises a pull on the bone of the shoulder (scapula): the latter is a lever (heavily weighted with the body, and therefore probably calling the shoulder muscles also into requisition); the former, held rigid by the grip on the rope or pole, partakes of the rigid attachment of the rope (to a beam or ceiling) and is therefore part of the fixed point or anchorage.

In the act of touch, this point is vital. For at the beginning, let us say, of the finger-stroke, the hand (the metacarpus) is the anchorage on which the lever (the finger) is swinging: but at the moment of contact with the tone, the strain, or pressure, is felt at both ends of the finger, at the keyboard and at the knuckle (metacarpal) joint. That is to say, there is a kind of "double anchorage" of the limb (in this case the finger), the whole forming a "brace" which supports the resistance (against the fulcrum) as discussed in Chapter V.[2] It is on this point that the whole theory of the act of touch, with its use of weight, fulcrum, and power, is founded. So important is it that it has been made the subject of the central chapter in this book.

Where these two points, outlined above, are interdependent, is as follows. At the moment of contact, where fixation takes place, the use of the weight of the whole or part of the arm depends on the realization of this "double anchorage." If the weight of the forearm is required, the wrist must be fixed in order to become one with and assist the forearm : if the upper-arm weight is required, the forearm must be fixed in order to be " of a piece " with the upper-arm. The double anchorage in these two cases is at the ends of the fingers and at the elbow in the one case, and at the ends of the fingers and at the shoulder in the other.

---

[1] See Chapter VIII.

[2] See also illustrations on pp. 48, 125.

It is this shifting of the anchorage by internal muscular direction which enables the weight of the different parts of the arm to be applied. The swift and controlled release of the muscles which suspend these different parts, so as to throw them from the original single anchorage on which they swing on to the double anchorage at the keyboard, is one of the forms of relaxation. A clear realization of this fact will enable the student to understand the real application of relaxation, which has been so obscured by loose and unscientific exposition in modern treatises on the subject.

Finally, knowledge of muscular processes and actions will enable the student to realize that the whole theory of obtaining tone rests not alone on the use of Weight, but on the use of Weight + Power (a fact which some modern teachers are apt to lose sight of), and that the latter involves the use of fixation, momentary though it may be, at the moment of contact with the tone.

The discussion of these latter points anticipates the contents of later chapters in this book ; while it has no direct relation to the discussion of the anatomy of the arm with which this chapter deals, it nevertheless serves to illustrate certain functions of the muscles : and it demonstrates still further the vital importance to the student of a sound knowledge of the structure of the arm, if technique is to be developed to the highest possible point.

CHAPTER IV

TECHNICAL TRAINING BY GYMNASTICS

It must be laid down at the outset that modern pianoforte technique involves the use of the whole physical organism, from the muscles in the body itself upwards through the shoulders and arms to the hands, all acting in co-ordination. The strength of a chain, however, lies in its weakest link, and it is therefore necessary to devote time and study to the training of the independent parts, the fingers, forearm, upper-arm, shoulders, etc., at the same time taking care not to lose sight of the important fact of co-ordination.

This training should be divided into two parts : one part—the muscular—should be to a very great extent away from the keyboard, and the other part—that dealing with movement, at the keyboard.

The training of the hands and arms by gymnastics away from the keyboard is still considered by many teachers to be unnecessary, even detrimental, to the acquisition of tèchnique. The old-fashioned finger exercises of the Aloys Schmidt school were designed as a gymnastic training for the hands, and, in the conditions which existed at that time—light touch of the instruments, weak balance of the keys, as well as the limited range of technical demand in the pianoforte literature of the period— may be said to have been sufficient for their purpose. The lack of knowledge of the use of the weight of the arm at that time is explained by the fact that the instruments would not have stood the strain of the tremendous power exerted in playing modern instruments, and the teachers of those days could never have had occasion to realize the fact that a blow of the finger, except a very light one producing a thin, innocuous tone, must connote an impetus from, or a reaction on, the arm itself. Prejudice, dying hard, was a great cause of the lack of progress of thought in this direction: despite the improvement in the instruments, and the expansion of the field of technique, unimaginative teachers, secure in their conviction that what was good enough for them was good enough for their pupils, continued to base their technical methods on these old and tedious exercises. A possible explanation of the prejudice is that students might have been apt to concentrate on this (gymnastic) training to the detriment of their musical development; the thought of a "royal road" to technique might, perhaps, have induced slackness in keyboard practice, and teachers whose aim was to foster industry in their pupils, realizing the danger, met it by insistence on the old grinding exercises. The failure of the attempts to acquire technique by gymnastic means is most probably due to inability to apply the physiological conditions to keyboard work, and the absence of scientific investigation and observation. The axiom that technique in the long run is mental more than it is physical, and in any case is the result of the co-ordination of both faculties, has only been realized within comparatively recent times. Mr. Macdonald Smith, one of the pioneers of gymnastic training, and a great authority on the subject, in a lecture delivered to the Physiological Association, laid great stress on this fact: "I can give the student a physical equipment, but not the mental: he must do that himself." Gymnastics are the best solution of the difficulty *provided that the student applies himself to their relation to keyboard work*, and cultivates his nervous swiftness as well as his physical strength.

In all gymnastic exercises the student should know as far as possible where the muscles are situated if he is to get the best results. It is not necessary, however, to assimilate all the details of the intricate machinery of the arms and shoulders: a certain amount of information on this subject has been given in Chapter III, where it will have been seen that there are many muscles which are interdependent and are called in to help the larger muscles. A general knowledge of the situation and function of the larger muscular groups (and the major movements of the arm) will be sufficient for the ordinary student. At the same time, while detailed knowledge is useful more for the anatomist than for the pianist, it is undeniable that it must be exceedingly useful not only to the virtuoso in his endeavour to arrive at the highest pitch of agility and endurance, but also to the teacher who wishes to be able to diagnose the technical and physical troubles of his pupils.

The aim of all gymnastic exercises is the ability to control and call swiftly into action the muscle or combination of muscles necessary for the performance of any technical difficulty, and unless the student practises his exercises with this knowledge, he is likely to become merely mechanical and automatic: he should always remember too that (as pointed out in Chapter III) every muscular movement has its reciprocal movement.

Exercises should be practised in three ways:

1. By alternately contracting and relaxing the same muscles.
2. By contracting one set of muscles, and, on relaxing them, setting up the contraction of the reciprocal set.
3. By moving slowly and steadily, avoiding stiff or spasmodic movement, and relaxing one set gradually, at the same time gradually in the same degree contracting the reciprocal set.

The shoulder exercises should be taken first, as the shoulder muscles carry the arm in almost every movement made at the keyboard, and are in practically continuous use during the entire act of playing.[1]

1. Shoulder Exercises.

(*a*) Let the right arm hang freely at the side of the body, keeping the shoulder muscle completely relaxed. Lift the arm until it reaches a position parallel to the ground (pointing to the right) with the hand at the height of the shoulder. (To lift the arm farther to its full length above the head is not necessary in a shoulder exercise, since this movement is made by the pectoral muscle and the trapezius.) As the movement is being made, the shoulder muscles should be gradually and firmly contracted, until the complete contraction is achieved, the arm being then in position.[1]

---

[1] See p. 57, on Balanced Fixation.

The strain of contraction should now be suddenly relaxed, and the arm allowed to fall loosely to its original position by the side of the body. At each respective movement of " contraction " and " relaxation " the student should try to realize (or " sense ") the inner feel of these muscular conditions. Particularly important is this in the matter of " relaxation." In all the general movements of life the muscles are more or less in a state of tension, and there are very few who can relax their muscles at will at first. Without this ability to relax, it is impossible to attain the faculty for isolating muscular movements, which becomes more and more important as technique becomes more advanced. This practice of " sensing " and memorizing trains the nervous connection between brain and muscle, and keeps such connection in a fit condition to function at any moment when called upon.

When this faculty for sensing the two different conditions of the muscles is mastered, the student should proceed to the practice of the next exercise.

(*b*) Raise the arm in the same way as in (*a*), but instead of allowing it to fall loosely, force it down vigorously by the contraction of the muscles under the shoulder (the pectoral and dorsal muscles).[2] At first it will be found difficult to release the contracted shoulder muscle owing to its instinctive desire to contract sympathetically with the others, but practice will soon enable the student to relax it at the moment of contraction of the others : indeed the relaxation should be slightly previous to the new contraction, the new muscles taking hold, as it were, of the arm and flinging it down unrestrained by any extraneous impediment.

---

[1] Exercises may be done sitting or standing. At first, the standing position is the best, as it braces the body and strengthens the trunk muscles which prevent the body from relapsing into the sagging and crouching position which often results unconsciously with the less alert students. Afterwards, the exercises should be practised in a sitting position, preferably on a stool, to allow free movement of the arms : the sitting position will be found to involve new conditions of balance, and the use of the body as a fulcrum. It will be obvious to any thinking person that if the piano were played in a standing position, the general "fulcrum" (or the fundamental fixed point) would come from the feet: in sitting this fulcrum must be at the hips.

[2] Fig. 1 gives a good illustration of the pectoral muscles and also of the deltoid.

Practising the exercise in this way combines both physical and nervous training and gradually educates the consciousness of nervous isolation which is so necessary to complete control of movement.

These exercises should be varied within the scope of their general movements. For instance, the arm should be raised to a position in front of the body (and also, as far as possible, to the rear). The position of the different parts of the arm should also be varied.

1. With the whole arm rigid and straight.
2. With the hand relaxed, hanging from the wrist.
3. With hand clenched : and also with fingers fully extended.
4. With forearm held loosely, the arm being bent at the elbow.

This position serves still further to isolate the shoulder muscles and to train the parts of the arm to be free when dealing with differentiating movements necessary in playing intricate passages.[1]

2. Upper-arm Exercises.

(*a*) Let the arm hang loosely from the shoulder, palm of the hand to the front. Contract the biceps muscle, bringing the hand up to the shoulder.[2] Relax the muscle, letting the forearm fall again in a relaxed state. Repeat the same exercise but with the back of the hand facing the front at the beginning of the exercise. This brings the brachialis into play, the hand being pronated.

(*b*) Repeat the movement, but act as in shoulder exercises (*b*), using the triceps muscles to pull the forearm vigorously downwards.

---

[1] It should always be borne in mind that although to a large extent and, in higher technique, almost entirely, the muscles help one another [*e.g.* the shoulder muscle helps the triceps in straightening the arm], yet the exercise of each muscle independently, as far as this is possible, is beneficial alike to their development and to the establishment of mental and nervous connection with them.

[2] Fig. 1 illustrates another aspect (with the forearm at the side instead of in front of the upper-arm) of this exercise.

PLATE II.

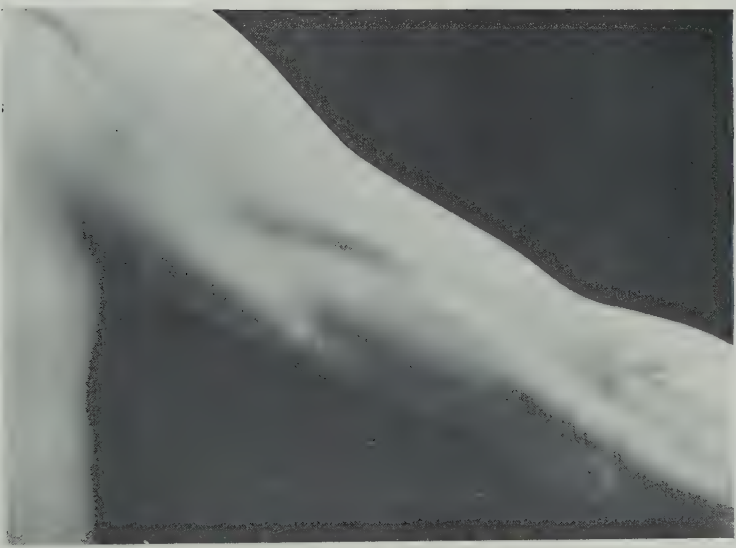


FIG 8.—Showing triceps muscular development of right arm.

(*a*) 1. Hold the arm at shoulder height, the arm parallel to the ground, palm upwards. Contract the biceps muscle, bringing the hand to the shoulder. Then try to relax the biceps muscle, the forearm naturally remaining in the same position.[1]

Repeat the same exercise with the palm facing the ground when arm is extended.[2]

(*b*) 1. Repeat the movements in (*a*) 1, but after brachial contraction vigorously straighten the arms by using triceps muscle.[3]

By using Exercise (*b*) in this form (*b*) 1, the triceps is enabled to act independently of the dorsal muscles : this independence is difficult to secure when the arm is hanging downwards as it is in (*b*).

These exercises should be practised with the hand (1) in a state of relaxation (hanging downwards), (2) rigid, in line with the forearm, (3) with the fist clenched.

(*c*) Hold arm out from the shoulder, palm upwards : turn the whole arm (not only the forearm, but also the upper-arm) on its own axis, the palm turning over in a direction towards the front until the palm of the hand faces upwards again, the hand describing as nearly as possible a full circle.

This exercise should be done with arm in different positions as in the shoulder exercises. Relax, if possible, after each turn : it will be necessary to use muscular force to turn back again.

(*c*) 1. Repeat exercise, but with the arm bent at the elbow ; and also with the forearm both rigid and relaxed, also with hand clenched and open.

3. Forearm Exercises.

(*a*) Rest the elbow on a table, forearm extended, palm flat on the table. Lift the hand on the wrist-joint, keeping forearm flat on the table. Relax the hand, letting it fall limply on the table.[4]

---

[1] See Fig. 2.

[2] There are two sets of flexing muscles in the upper-arm, the biceps and the brachialis. The former acts also as a supinator, *i.e.* it is used to turn the forearm and hand to the position in which the palm is upwards. By flexing the forearm with the palm downwards the biceps is exercised in its flexing function only, assisting the brachialis, which does the major part of the flexion.

[3] See Fig. 8.

[4] This exercises the wrist extensors.

(*b*) Proceed as in shoulder and arm exercises (*b*), forcing the hand downwards on to the table.

This exercise can be varied and improved by flexing the fingers slightly as if playing the pianoforte: it is still better if practised at the keyboard on chords of the 6th, or any chords within the compass of an octave. In this case the forearm should be kept quite still so as to confine the muscular movement to the muscles concerned, viz. those situated on the upper and lower parts of the forearm, actuating the fingers and wrist.[1]

(*c*) Hold the arm out straight, and turn the *hand* in the wrist-joint in a rotating manner on its own axis. Do this with the hand closed, and also with it open. Repeat the exercise, but with the elbow bent.

(*d*) The same positions and conditions as in (*c*), but combining the flexing, extending, and rotating movements of the hand, the latter describing a circle with the wrist-joint as centre. This is the action known as circumduction.

4. Finger Exercises.

In considering finger exercises, attention should be paid to the situation and action of finger muscles, as outlined in Chapter III. They are distributed about the forearm and hand, and, owing to this distribution they are operated by tendons to a larger extent than other muscles. It is necessary, therefore, to consider the question of developing not only muscular strength, but also the elasticity of the ligaments of the joints, in order to allow freedom to the tendons.

It is possible that ligaments may be so stiff as to make it almost impossible to train the hand to any degree of flexibility: such instances, however, are exceptional, and it rarely happens that hands are found that cannot be developed by steady and persistent exercise and massage. Attention should be paid to the palmar surface, and all roughness and hardness eliminated

---

[1] Care should be taken to see that the extensors of the wrist are well contracted. This applies, of course, only in the practice of this as a gymnastic exercise. In actual playing the action is considerably modified.

PLATE III.

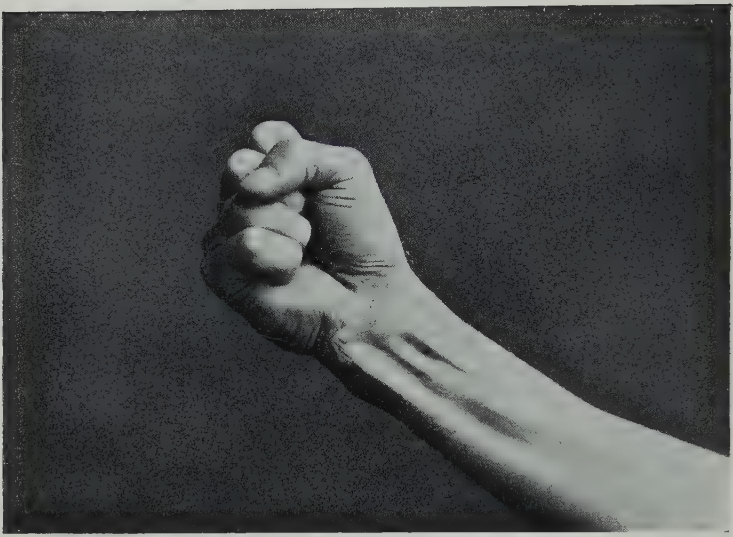


Fig. 9.

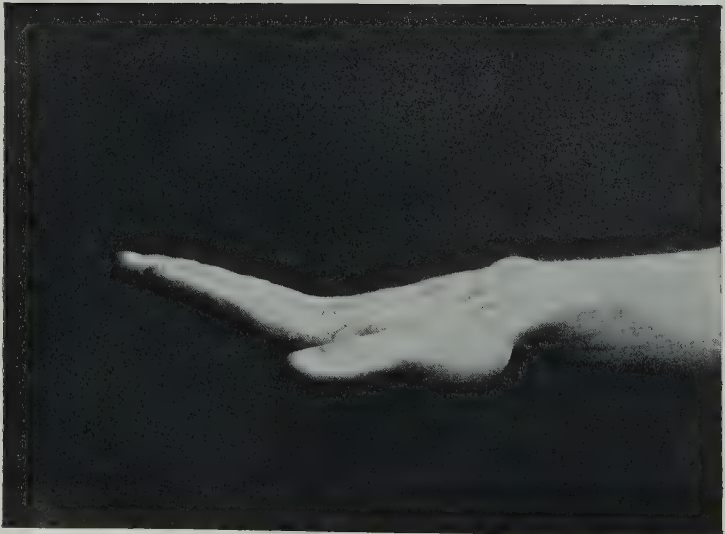


Fig. 10.

by massage and stretching. The same applies to the web at the base of the fingers.

Weakness of stretch is very often due as much to inability to abduct and adduct the fingers as to ligamental trouble. With most people, when they are asked to open out their fingers, the gap is smallest between the 3rd and 4th fingers: yet, when their attention is called to this, they will almost always show that they are able to widen this gap by their own muscular effort, thus proving that the real weakness is lack of muscular concentration.

The following exercises, if performed accurately, will help to solve the two problems of flexibility and strength. They are based on the fact that the fingers are operated by comprehensive muscles which control groups of fingers. (See diagrams in Chapter III). Individual fingers are controlled by separate nervous impulses, each nerve connection controlling its own part of the large comprehensive muscle, and for this reason those exercises are best which will develop the group muscles. At the same time some exercises are given for the 4th and 5th fingers. Nervous control can be developed by the practice of inhibition and relaxation, both of which are discussed in the course of this book.[1]

1. (*a*) Clench the fist vigorously, thumb being outside the fingers and stretched well across to the little finger.[2] Feel the contraction of the lumbricales in the palm (these flex the first phalanges: the flexors in the arm flex the other two phalanges, and *continue* the flexing of the first phalanges).[3] Then relax this clenching action.

(*b*) Clench as before: then, instead of relaxing, extend the fingers backwards, making, if possible, a concave hollow at the knuckle-joint.[4]

(The extensors of the fingers which are situated in the forearm control the first phalanges, the interossei controlling the 2nd and

---

[1] Exercises should be varied by being performed with the arm in different positions, such as:

(1) With the arm fully extended in any direction.
(2) With elbow bent.
(3) With hand pronated or supinated, or each of these alternately.

[2] See Fig. 9.

[3] See Chap. III, p. 27.

[4] See Fig. 10.

3rd.) The big extensor muscles in the forearm have a tendency to open out the fingers laterally in this action: this tendency should be allowed full play. The exercises may, however, be varied by performing the extending action with the fingers close together.

Always bring the thumbs *back* with the fingers.

2. (*a*) Hold the fingers in a straight line with the back of the hand. Flex the first phalanges from the knuckle-joint, leaving the 2nd and 3rd phalanges relaxed as far as possible.[1] This flexion should be mainly felt in the lumbricales region, situated in the palm of the hand. Relax the flexion, letting the hand remain limp.

(*b*) Proceed as in (*a*), and pull the same phalanges backwards, still keeping 2nd and 3rd phalanges relaxed. (This extension is felt in the back of the forearm.)

2 (*a*) exercises the lumbricales which flex the 1st phalanges: the feeling of contraction should occur in the palm of the hand. The reverse of this, as already shown (in Chapter III) is the extensor action of the interossei which actuates the 2nd and 3rd phalanges, and the feeling of contraction occurs in the corresponding place at the back of the hand. The following is the exercise for this:

(*c*) Keep the hand in the position of 2 (*a*) (as shown in Fig. 11) and alternately flex and extend the 2nd and 3rd phalanges.

(This extension may be practised with separate fingers, or with different groupings of fingers. The best grouping is that of the 2nd, 3rd, and 4th fingers together, and the little finger separately.)[2]

Throughout exercises 2 (*a*) and 2 (*b*), the thumb should be kept relaxed (or inhibited) as far as possible.

3. (*a*) Hold the hand with fingers extended, thumb in line with them, all held closely together. Vigorously open out (abduct) the fingers and thumb laterally, and then relax.

---

[1] See Fig. 11.

[2] The "double-finger" exercise devised by Mr. Macdonald Smith is one of the best possible ones for this purpose: this exercise develops the lumbricales and interossei at the same time.

PLATE IV.

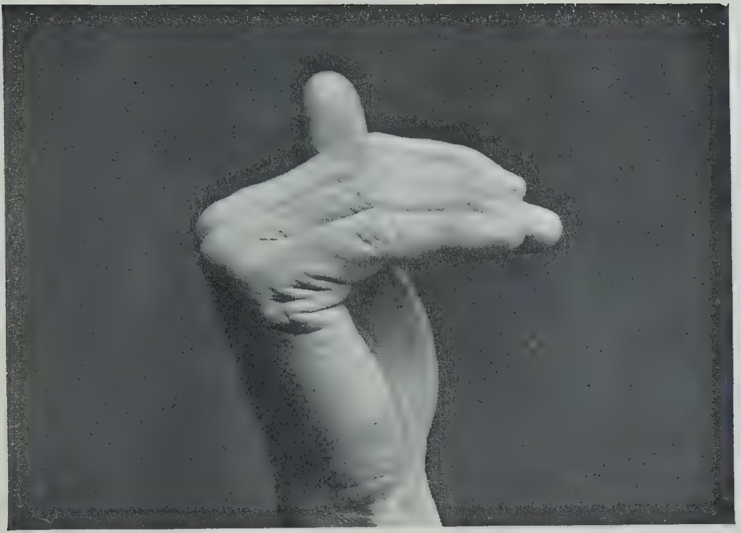


FIG. 11.

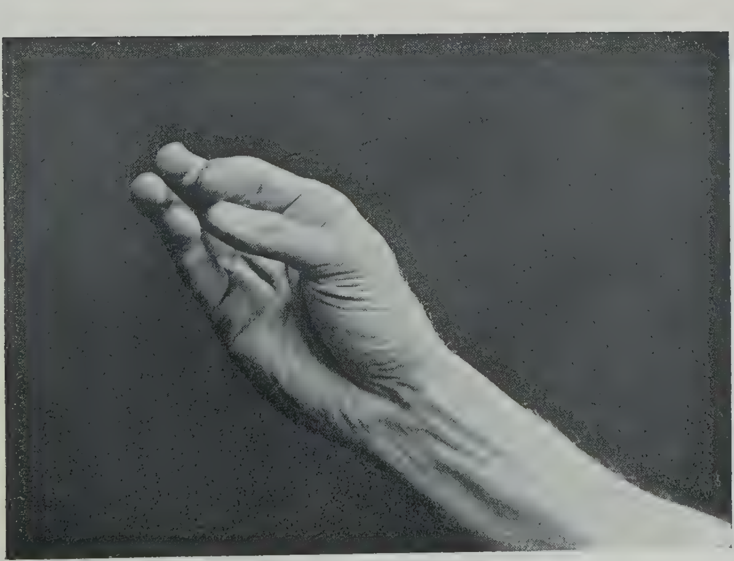


FIG. 12.

(*b*) Proceed as in (*a*), but close the fingers again (adduction) vigorously.[1]

5. Little Finger Exercise.

Place the tips of the 2nd, 3rd, and 4th fingers on the end of the thumb, *keeping the knuckles of all the phalanges bent.* Move the little finger backwards and forwards, *keeping it straight throughout the exercise.*

6. Ring Finger Exercise.

Place tips of index and middle fingers on thumb in same way, and move ring finger backwards and forwards. The little finger should be left to swing freely.

These exercises (5 and 6) can be practised perhaps more easily by placing the fingers on the other thumb, or even on the edge of a table. The object of the exercise is to secure free articulation at the knuckle-joint. The movements, both of flexion and extension, must be vigorous.

7. Thumb Exercise.

(*a*) Hold the hand with fingers extended. Bring the thumb across the palm of the hand, reaching towards the root of the little finger: then relax.

(*b*) Proceed as in (*a*), but bring the thumb back again vigorously.

Practise (*a*) and (*b*) with the fingers clenched.

It must be understood that these exercises are purely *gymnastic*, designed to give the student the muscular equipment necessary for pianoforte technique, and a faculty for "sensing" the contraction and relaxation of the different muscles used in playing, ultimately attaining the ability to contract muscles at will with the minimum amount of limb movement. This will be specially useful in higher technique, in the study of vibrato, where muscles and fascia[2] must be "set" in order to perform certain technical difficulties.

---

[1] See Fig. 12.

[2] See Chap. III, p. 26, footnote.

It may be argued that the daily practice of gymnastics must be tedious and uninviting. The answer to this objection is another question. Is it not much more tedious and nerve-wracking to practise endless repetitive finger exercises at the keyboard? *Systematic daily attention* to the exercises given will endow the student with all the equipment he needs. As time goes on he will acquire that feeling of power and control over his movements which will enable him always to reproduce his playing of any piece which he may have in his repertoire, provided that he can be sure of his memory and his mental grasp of the piece undertaken.

The practice of the arm and shoulder exercises will equip him with the power to acquire the technique for octave and chord-playing. This branch of technique is not sufficiently provided for in ordinary technical exercises at the keyboard. It is generally left to a later stage, and as often as not neglected altogether.

Finally, he must realize that the mere practice of gymnastics will not give him technique. He must not abrogate his work at the instrument itself: it is always important to study the "geography," as it were, of the keyboard, and he must look upon his gymnastics as a means to the end of shortening the period of technical study, and of helping him the better to study the application of physical conditions to keyboard work. Only by knowing his technique physiologically and mentally will he establish the condition of permanence which is the criterion of achievement on any musical instrument.

CHAPTER V

THE ACT OF TOUCH

"Good Tone is the true criterion of sound technique."

From the earliest times of pianoforte teaching, when serious attention was first given to technique, position at the keyboard, position of the hands, finger-action, etc., many methods and theories have come and gone. The early teachers naturally concentrated on the hands, since in their limited vision the arms did not enter very much into the technique of the piano. Hence their practice of giving "still-hand" exercises which restricted, and very often entirely eliminated, the movement of the arms. Most of the early methods started at this point of finger-training, only gradually allowing the use of wrist and forearm as the technique of pupils developed. Too often it happened that the pupil, trained to keep his arms rigid when using his fingers, found the greatest difficulty in using his arms when he came to attempt octave and chord-playing. The practice of rigidity impeded the attainment of free movement, or, if such freedom was obtained in some miraculous way, it was at the expense of the breaking-up of the laboriously acquired finger-technique: fingers were unable to function except with a rigid arm, and the pupil arrived at a technical impasse, often acquiring some disability like "pianist's cramp" on the way.

Gradually, from observation of the playing of the great virtuosi, teachers evolved new methods of technique, which reached their culmination in the discovery of the use of the weight of the arm. Instead of beginning in the stereotyped fashion with finger exercises, they started at the other end, as it were, and taught the free movement of the arm, thereby opening up and widening the field of technical research. But even now, controversy rages on the subject of relaxation, neglect of finger-training, etc. The exponents of the latest school are attacked, and often justly so, for their untidiness in finger work ; they are even attacked at the point where they boast of their pre-eminence, that of tone-production, and again with some justice ; for, either through lack of balance, or over-indulgence in uncontrolled weight-technique, many of them produce harsh and rough tone. Indeed, the tone produced by one of the leading protagonists is almost unbearable in its hardness and ugliness.

What, then, is the solution of the problem of the act of touch ? What is it that enables the great players to play with such apparent ease, and many of them, though not by any means all of them, with such excellent tone and brilliant technique ?

One answer will cover both these questions. It is : *Perfect timing of muscular movement.* This carries with it all such problems as balance and control of weight, variety of touch, brilliancy, etc.

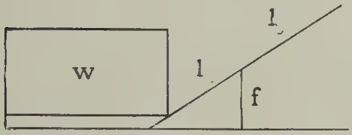
The technical genius who possesses this gift of timing by natural endowment, is very probably unconscious of its meaning, and is more than likely to be incapable of imparting it to others because of inability, or perhaps disinclination, to analyse it.

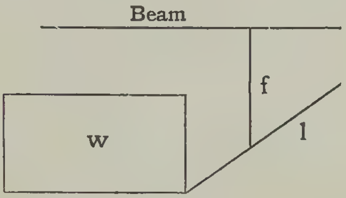
We can only arrive at a definition of " timing " by analysis of the factors concerned, of which the most important are the laws of leverage, and the physiological conditions involved in playing. An examination of the ordinary physical movements of everyday life will also be useful, and may help us to apply the above conditions to keyboard work.

1. Leverage.

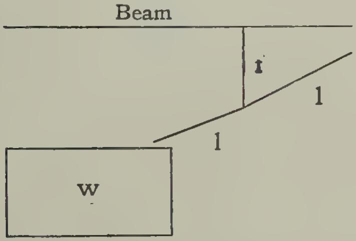
The factors of Leverage are Power, Weight, and Fulcrum. In the figure given below, *w* is the weight, *l* is the lever (where Power is exerted), and *f* is the fulcrum. If this fulcrum were not present, leverage (by downward pressure on the end of the lever) would be impossible, since the only result of that pressure would be to make the lever fall flat, with no effect on the weight.

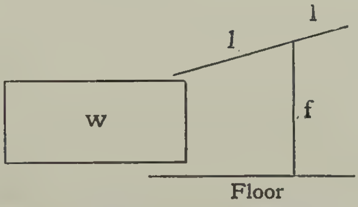
The fulcrum may be either above or below the lever. If below, it may be anything solid (*e.g.* a block of wood, preferably, though not necessarily, fixed to the ground). If above, it may take the form of a rope or rod suspended from a beam, with the lever fastened to it.





Again, if the figure be reversed, and a downward leverage be required, the fulcrum, when it is above, would have to be solid, and when below, could be either a solid body or a rope, fastened to the lever. In this case the power applied to the lever would be in an upward direction.





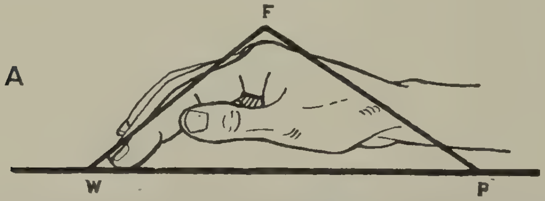
The point to bear in mind is that the end of the lever which impinges on the weight has no effect on it till the fulcrum comes into action : the power acts through the fulcrum, and the energy thus takes effect *throughout the lever* from the end where power is exerted, through the fulcrum, to the weight to be moved.

In applying the principle to the keyboard, we are dealing with the second example, where downward pressure has to be exerted. It is also important to remember that, owing to the hammer acting on the escapement principle, the point where the pressure is exerted (*i.e.* where the hammer hits the string) is a passing one, and the energy of leverage beyond that moment is a diminishing one, the power being relaxed.

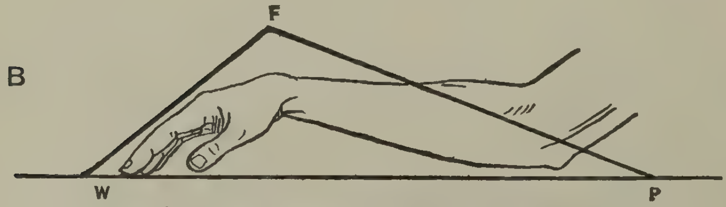
Further, the levers (fingers, hands, or arms, as the case may be) contain within themselves the sources of power, in the form of muscular strength, differing from the above illustration, in which power is exerted from outside the lever. Hence the fulcrum in this case is at one end of the lever (not in the middle), the latter swinging on the fulcrum.[1]

In finger action, the finger swings from the knuckle-joint, and the power is applied by the flexor muscles of the fingers, which start in the hand and continue into the forearm. The knuckle is the fulcrum, and the energy is exerted against the keyboard by means of the flexing muscles in combination with this fulcrum.[2]

The following diagram illustrates this :



A. Power from finger and forearm muscles, with knuckle-joint (metacarpus) as fulcrum.



B. Power from upper-arm muscles, with wrist-joint as fulcrum.

The leverage of the hand is exerted in a similar way, the flexors in the forearm acting as the power, and the carpus, or wrist bones as the fulcrum. Again, in a forearm stroke, the triceps acts as the power, and the elbow as the fulcrum.

---

[1] This fact enables the use of the description " anchorage " to denote the combination of both origin and fulcrum. See footnote, p. 19.

[2] The smaller knuckles of the phalanges of the fingers are themselves fulcra, which support the pull of the tendons which connect these phalanges with the finger muscles, and help to strengthen the rigidity of the finger-lever. It will be obvious from this that these knuckles should be bent in order to secure that strength, and knowledge of this fact is a guide to correct finger action. Any " trigger-action " in raising the fingers is thus a waste of energy, and equally, playing with " flat " fingers is subversive of strength.

Further, just as in finger action, the knuckles of the phalanges of the fingers act as fulcra in the major fulcrum at the knuckle-joint (metacarpus), so also in wrist action the metacarpal fulcrum becomes a subsidiary fulcrum to the major fulcrum at the wrist. Similarly, the wrist in its turn supports the elbow-fulcrum in forearm action, and the latter acts in the same capacity towards shoulder in whole-arm action. In whole-arm flexion, the pectoral muscles act as power, and the shoulder (scapula) as fulcrum.

In order to be quite clear as to the term " anchorage," reference should be made to the description on p. 19. The origin of attachment of the muscles producing a given movement and the fulcrum on which the limb pivots are together described as the " anchorage."

For example, the fulcrum in the case of finger action is the knuckle at the end of the metacarpal bone. This fulcrum is, of course, maintained in a fixed position by the steadying action of the forearm muscles. The attachment of the finger-muscles in the hand and forearm and this knuckle-joint together form the anchorage of the swinging finger, and their combination enables the pressure to take effect at the other end of the finger, so securing what is here called the " double anchorage " at the moment of pressure on the key. It may be said, then, that the pressure is exerted throughout the length of the limb which is in action, the limb, as it were, starting from a single anchorage, and ending on an anchorage at both ends.

All this illustrates the point made above, that the leverage once exerted is spread over the whole length of the lever. In the act of touch, it is obvious that the arm, or whatever part of it is being used as a lever, must be, at the moment of contact, in a condition of resistance, necessitating muscular *contraction*.

A simple way of " sensing " this contraction is to place the hand lightly on a table or any flat surface : then, if pressure be exerted, the feeling of contraction will immediately be encountered.[1]

---

[1] See experiment, p. 125.

It is the perfect " timing " of this sensing that constitutes the real act of touch.

It is obvious that the more relaxed (or, to put it in another way, the less muscularly committed) the arm or hand, previous to reaching this moment of " sensing," the more acute the sense of timing will be, and the greater the energy with which it can be employed. Equally obvious will be the fact that the resilience of the effort after this moment will render the arm free to operate again in the same way. Further, the *intention* to relax (or " follow through ") the effort, once this point has been reached, will be an invaluable aid to, if it does not entirely connote, the perfection of sensitiveness and energy at the exact moment of timing. It is in the practice of this " isolation " of the point of greatest energy that the value of relaxation is realized : much of the controversy about relaxation arises from the misconception of the true conditions here.

It was said above that the lever had no effect on the weight until the fulcrum came into action. The same principle applies to pianoforte playing. The hammer has no real effect on the string until the point of muscular pressure is reached : it may be set in motion by merely giving the key a blow, communicating a momentum to it, but the resulting tone has no character, nor can it be in any sense under control.[1]

This precise point where the muscular resistance is " sensed " is the point at which any keyboard stroke, whether by finger, hand or arm, must be aimed. There is a theory in physical science that all inert masses have an upward thrust. The player must imagine that the keyboard has such an inertia with its upward thrust : and that the meeting-place of the two forces, the energy of the arm (whether muscular or by use of the relaxed and falling weight) and the upward thrust of the keyboard, is the point where the hammer hits the string. It must be realized that this point is not the bed of the keyboard, but a point just before the bed of the keyboard is reached. The fact that this point is resilient, not rigid, since it occurs in the course of key-descent, and not at the end of it, thus enabling a relaxed follow-through to take place, and further, that the pressure on the double anchorage is muscular and therefore elastic, only serves to emphasize the importance of perfect timing of the feeling of resistance of the hammer before the bed of the key is reached.

---

[1] The conditions which are present in brilliancy and vibrato call for a slight relaxation of this principle. They require different treatment, and are dealt with in Chapter XI.

This point is henceforward referred to as "the point of contact."

In the act of touch there are three things to consider:

(1) The approach towards the point of contact.
(2) The point of contact itself.
(3) The departure from that point.

Of these, (2) and (3) are obviously dependent on (1): (2) is the culmination of the energy set in motion by the factors (or forces) used in (1), and has already been defined above: (3) deals with the relaxation of the energies exercised in (1), and with the transition to any succeeding cycle of operations. The effective use of (3) depends on the proper performance of (1), and its function will become clearer as we proceed with the analysis of (1), which is by far the most important of the three and is indeed the kernel of all problems of technique.

The factors of (1) are:

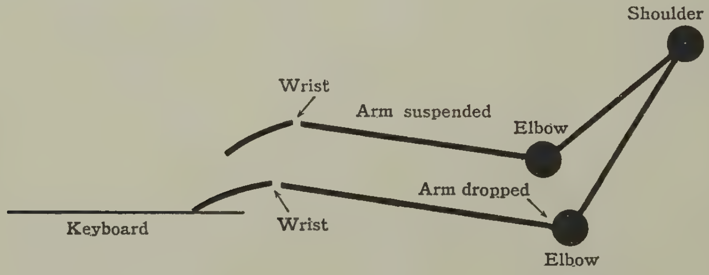
(*a*) The use of the weight of the arm.
(*b*) The use of muscular effort, both independently of (*a*) and in combination with it.
(*c*) Balanced Fixation.

It is necessary to understand clearly at this point in the definition that we are dealing entirely with the *approach* to the point of contact, and *not* with the point of contact itself. This reiteration is important in order to avoid any misconception of the above division of factors—(*a*) and (*b*)—since at the point of contact *both weight and muscular action come into force.* This will have been seen from the illustrations already given.

(a) Use of the Weight of the Arm.

When the arm is held straight out from the shoulder, parallel with the ground, it is held in that position by the contracted shoulder muscle (deltoid).[1] The sudden relaxation of this contraction causes the arm to fall to a position by the side of the body. If the relaxation, instead of being sudden, be gradual, the speed of descent will be slower. The regulation of this speed of descent is governed by the degree of control exercised by the controlling shoulder muscle. Again, if this sudden relaxation be used, the speed of descent can be accelerated by the effort of the muscles which bring the arm downwards (the pectoral and dorsal muscles).[2]

The arm can be held suspended over the keyboard and allowed to drop in the same way. In this case, it is, of course, held with the elbow bent. This fact, obvious as it is, needs to be emphasized, since it is very useful, in practising this movement, to imagine the elbow to be itself a weight, the descent of which exerts a " pull " on the forearm and hand. This can be seen by the following illustration.



The unimpeded, unaccelerated descent of the arm on to the keyboard is the " pattern," as it were, of all movement towards the keyboard. The speed of descent will determine the quantity or volume of tone. (The quality of tone depends upon the proper employment of the factors which operate at the " point of contact.") The limit of this quantity of tone will depend upon the actual weight (in terms of avoirdupois) of the arm itself. The heavier the arm, the greater the power of momentum. This should be clearly understood. It is a scientific fact that the speed of descent of any falling body is constant: but the *power* delivered by a falling body varies as the amount of weight. If a 16 lb. weight and a 2 lb. weight be let fall at the same moment from a similar height, they would reach the ground simultaneously: but the former would make more noise, or a bigger indentation than the latter. The important thing to realize from this is that the power delivered by any given weight is governed by its speed of descent.

---

[1] See Shoulder Exercises 1 (*a*), Chapter IV. See also illustration of deltoid in Fig. 1.

[2] See *ibid.* (*b*).

The free descent of the arm on to the keyboard is arrested by the hand coming into contact with the keyboard (*i.e.* it is not stopped by any "braking" action of the shoulder muscles). If the hand were a hard unyielding substance, this contact would result in a "thud" and the consequent tone would be harsh. The dropping of any hard substance, such as a book, on to the keyboard will sufficiently demonstrate this. The difficulty is avoided by "catching" the weight with the resiliency of the flexing muscles, as shown earlier in this chapter. It is analogous to the "give" of the arm in catching a heavy weight: a good illustration is that of a bricklayer catching the bricks thrown at him by his mate: he lets his arms "give" in order to avoid the jar of the falling bricks. This is another form of correct "timing." This, however, is dealing with the point of contact. We are still dealing with the approach to that point. It was just said that the unimpeded descent was the "pattern" of all forms of approach to the keyboard. One reason for this has also been given, viz. that the more relaxed the muscles in the approach to the point of contact, the more sensitive they are to correct timing. Another reason is that any spasmodic checking or snatching in any part of the arm not only interferes with the original impulse, but causes friction among the muscles concerned, and restricts the freedom of the descent. Hence it follows that during descent, any *sudden snapping* back of the hand on the wrist,[1] or of the fingers, should be avoided, as being an impediment to free movement. It might be urged that the

---

[1] The "throwing" or "flicking" of the wrist in Vibrato-playing is not to be confused with this action. Such "throwing" is done with the wrist in relaxation. See Chapter XI.

gradual relaxation of the shoulder muscle, mentioned above as regulating the speed of descent, constitutes such an impediment. In reality this is not so, since the muscular action of the shoulder muscle (*i.e.* the relaxation from contraction) is *uniform* and pre-determined, and not spasmodic. If the free descent (in the " pattern " illustration) were interrupted by *sudden* contraction of the shoulder muscle, then it would indeed be an impediment. Similarly, a *gradual and pre-determined* pulling back (extensor action) of the hand,[1] or fingers, does not constitute an impediment, any more than the extensor action of the toes or feet in the act of walking.[2] The distinction here outlined between spasmodic action and gradual action is a vital one, and clears up the difficulty of finding the mean between the stiffness of the older school of technique and the flabbiness caused by the misunderstanding of the relaxation method of the later school.

When the arm is held in suspension by the shoulder muscles, ready to descend, the hand should be hanging loosely in the wrist, and the forearm maintained in a position almost at right angles with the upper arm : during descent these parts of the arm may be (1) maintained in these positions or (2) varied, according to the exigencies of technique. In (1) the maintenance of rigidity of the positions mentioned would result in the arm reaching the keyboard with the wrist arched, and without any " give " in the joints ; this movement would be used if the desired tone were to be of a hard quality. In (2), during descent, the forearm may be slightly extended by the gradual and uniform contraction of the triceps muscle, the hand at the same time being raised from its hanging position (by extensor action) to a more horizontal position, so that at the point of contact the whole arm would be " flatter " (more horizontal) than at the beginning of the stroke, thus allowing the flexing muscles the better to " give " at the point of contact, and so secure a better quality of tone. These movements of the forearm and hand *if gradual and uniform* are not only not impedimental, but on the contrary they conduce to a more supple and flexible co-ordination of the different parts of the arm.

[1] See (2) below.

[2] See analysis *passim*.

It will be clear from all this that the approach to the point of contact, whether unimpeded, gradual, or accelerated, should be exercised with all parts of the arm free from *spasmodic* movement: that mere passivity of all or any part of the arm is not always necessary or even advisable; but that at the same time any movement of these parts preparatory to striking should be gradual and uniform: and that these conditions hold good at whatever speed the blow is delivered.

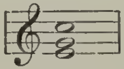
This matter of speed leads us to:

(b) The use of Muscular Effort (in accelerating the speed of descent).

It has been said above that the power of momentum of any given weight depends upon its speed, and this speed is, in its turn, dependent upon the height from which it falls, unless some other agency is employed to impart energy to it. It is obvious that the arms cannot always be raised to a sufficient height to secure this power of momentum. In the first place such movement is not at all elegant: in the second, in quick movements it could only be done by violent physical exertion: and thirdly, the element of chance in striking the right notes is unduly pronounced. The difficulty can be met in two ways: either by using only a part of the arm, the forearm for instance, with the elbow as a fixed anchorage, or by using muscular action to move the weight of the whole arm, with the hands held much closer to the keyboard. Method 1 is useful for quick repeated movements, and Method 2 for single movements or slow repeated ones.

METHOD 1. *The use of a part of the arm by itself.* This necessitates the partial fixation of the part which controls it, generally that immediately above it. For example, if the forearm is used, the upper arm must be more or less rigid in order to act as an "anchorage" for the forearm to swing from. Any undue movement of the upper-arm forces the forearm to move with it, and so nullifies the extra speed obtained by using the forearm alone. The same applies to the use of the wrist (hand) by itself, when the forearm is in partial fixation. Total fixation is inadvisable except in special cases.[1] This method has the advantage of greater speed in repetition, but the disadvantage of inhibiting the extra power obtained by the additional use of the upper-arm at the point of contact. It is possible, however, by practice, to secure the relaxation (at the point of contact) of the fixation of the "anchorage"[2]; when this power of swift relaxation has been attained, this method will be found of great advantage in chord and octave playing.

METHOD 2. *Acceleration by muscular action.* Let the hand be placed on the surface of the keys, or close to it, ready to strike a given chord, *e.g.*



(The fingers should be held in a state of *nervous* preparation for the shape of the chord.) The arm is held suspended in the shoulder in the same way (as it would if it were held higher). At the required moment, the shoulder is relaxed and the arm is suddenly pulled down by the action of the pectoral and dorsal muscles.[3] This method necessitates the "low-fall" action of the wrist.[4]

The following method illustrates the "high fall." Instead of the arm being pulled downward by the pectoral and dorsal muscles it should be thrust forward by the combined action of the triceps muscle (extending the forearm) and the shoulder muscle itself (lifting the whole arm forward). These movements secure the freedom of the elbow-joint, and the more flexible co-operation of the whole arm.

In either of these cases, the conditions of freedom from spasmodic movement hold good. The initiation of movement must always be a nervous impulse (and the act of relaxation is nervous in this sense that it means the shutting-off of the nervous impulse involved in the contraction necessary for the inception of the movement: it might be called a negative nervous movement), and the full muscular strain should come at the point of contact; all approach to that point should be free from muscular commitment except that involved in the initiation of the approach.

---

[1] These are dealt with more specifically in the chapter on Vibrato.

[2] This can be done by using the undulating movement of the wrist. See Chapter VI.

[3] See "Shoulder Exercises," 1 (*b*), Chapter IV.

[4] See Chapter VI.

(c) Balanced Fixation.

The above examples have been dealing with the production of the ordinary round tone which can be secured by the free descent of the arm. The unimpeded descent of the arm has been constantly referred to, and the principle of the freely falling weight assumed throughout.

When, however, these principles have been mastered, there still remains the problem of control of the variety of tone, and here we come to the subject of the balance of the arm, which cannot always be secured by mere relaxation, however well graduated, of the suspending muscles.

Take, for example, a very slow descent of the whole arm on to the keyboard. If this descent is carried through by a gradual relaxation only (using the shoulder muscle), it is possible that (owing to the escapement construction of the hammer mechanism) the key may be depressed without any sound being extracted from the string. This is due to the fact that there is insufficient positive momentum imparted to the hammer to get it past its escapement and make it *strike* the string.

The imparting of this momentum is the problem to be considered. The old schools solved it by uncompromisingly hitting the key with varying degrees of strength. The later schools endeavoured to achieve it by letting the weight fall in varying degrees of speed. The former method always found the tone, but it was hard, though not without variety: the latter method, though not always finding the tone (owing to the difficulty of speed just mentioned), nevertheless secured much greater beauty of tone, but its variety was limited, owing to the absence of controlled fixation, movement being often too loose and free.

There is no doubt that the mere gradual relaxation of the muscles is not enough. There is in it a limit to the slowness of speed of descent, which is governed, too, by variation in heaviness of the key-action itself. If the descent is too slow, or rather, if the momentum is negative, and has no positive muscular movement as well, frequently no sound will ensue.

The solution lies in the study of the relations and combination of the three things, Power, Fulcrum, and Weight, as outlined in Chapter III. The use of the elbow as a Fulcrum, with the forearm as the Weight, and the muscles of the upper-arm as the Power, is an example of what should take place in the positive action necessary to make the hammer hit the string. Here the descent of the weight is steadied by the brachialis, but the power is delivered by the triceps muscle, using the elbow as a Fulcrum, pulling the weight of the forearm down with power and momentum sufficient to manipulate the hammer. The net result is that both the brachialis and triceps act together, the former gradually relaxing, and the latter gradually contracting, steadying the descent of the forearm, and at the same time imparting a continuous momentum. There is no mere relaxation and falling weight, but Weight + Power.

The same process takes place when the whole arm is being used, and also with the use of the fingers. In the former case, the shoulder muscle is the relaxing one, and the pectoral muscles are the contracting ones, pulling the arm down, the shoulder bone being the Fulcrum. In the latter case, Power is needed more, owing to the slight weight of the fingers. The forearm flexors supply this, and the knuckle (metacarpus) is the Fulcrum.

From this it is obvious that in any manipulation of weight, if control is required, there must be a fixation, balanced according to the volume and quality of tone needed, and this fixation occurs at the anchorage or Fulcrum.[1] This fixation of the Fulcrum is the important point which is so often missed by the teachers of the Relaxation schools, and its incidence on finger work cannot be neglected. As already stated, the fingers need Power, and for that they need a fulcrum, both in initiating their movement and in meeting resistance at the keyboard. And the fulcrum of the knuckle-joint depends on that of the elbow, which stands ready, as it were, to assist it if any extra strain is put upon it. When, however, the fingers are used with great strength, as in chord-playing, or even of passages in single notes, their fulcrum is fixed and merged into the other fulcra, according to the degree of strength required. They may be swung loosely during approach to the point of contact, but at that point they are " locked " with the rest of the fulcra in the arm.

---

[1] This point is further dealt with in Chapter VIII.

The chief lesson to be drawn from all this discussion is that, while each part of the arm may act independently, using its own muscular inception, and its own fixation of anchorage for approach and contact purposes, yet at the same time practically all movement is contained in and initiated by the shoulder muscles. The arm may be said to be *carried* in the shoulder, its parts, with their own self-contained mechanism, ready to operate in co-ordination whenever and wherever they are wanted. From this it need not be emphasized, so obvious is it, that the more supple the whole arm is, and the less baneful stiffness there is in any part of it, the greater will be the chance of suppleness and swiftness. The student needs only to bear in mind, in all his technical practice, that the whole arm, however small a part of it may be in operation at the moment, must be kept in a state of supple resilience, free from any pre-conceived, stereotyped notions of stiffness.

2. The Point of Contact.

This factor has already been discussed in the early part of this chapter. Some further examples may help to make it more clear. It must be clearly grasped that at the point of contact the muscles act as supports of the weight of the arm, in addition to being spear-heads, as it were, of any imparted muscular energy. They must therefore be in a state of contraction.

The right understanding and proper management of this contraction is the cause of the production of good tone, as well as of the securing of the right technical conditions (in a muscular sense). It is also important to realize that it should ultimately, as the result of continued practice, be reduced to the shortest possible duration, commensurate with full consciousness and control.

The following analogy may be of assistance in the investigation of its nature.

In using any instrument for delivering a blow, say a cricket bat or a golf club, a buffer is provided: in the former it is a splice, in the latter a flexible shaft. The resilience supplied by these buffers acts in two ways, in the one by imparting greater speed at the point of contact (the muscular power being communicated to the vibration speed of the implement used), and in the other by easing the repercussion on the arm, enabling its muscular speed to be unimpeded by the sudden shock of contact.

In striking the keyboard the flexing muscles (and, of course, the triceps, which is an extensor), which, as already described, are supporting the blow, act as buffers in the same way, preventing a shock to the arm:[1] they also contribute by this same action of resilience towards avoiding a thumping effect, and thereby secure greater beauty of tone. There should be the same sensation of flexibility and speed as in the use of the cricket bat or the golf club.

Another analogy—that of the act of walking—may be taken. Here we have an almost exact reproduction of the conditions already defined as being present in pianoforte playing. The leg moves gradually forward in a uniform manner, not falling in a relaxed heap, but controlled by the muscles which connect it with the body: its own muscles are in a state of sensitive nervous preparation ready to act at the point of contact, the flexing muscles of the toes, and those of the feet (in the calf of the leg) taking and supporting the strain of body-weight as the foot touches the ground. The foot does not strike the ground, nor can it be said to touch it gingerly: the contact with the ground and the repercussion on the whole muscular organism are practically simultaneous. Furthermore, this steadying action of the muscles in taking up the repercussion acts as a bridge to the movement of the weight of the body on to the other leg in taking the next step. The sustaining muscles act as a spring on which to propel the body forward. This is an important point which, if it be applied in the practice of slow legato finger work on the piano, will go far to solve the problem of teaching true and correct finger-action. Example 1, p. 62, will elucidate the point.

---

[1] The flexible undulation of the wrist and knuckle joints is an important factor in assisting this resilience, as well as the perfect timing of the shifting of the "single anchorage."

As a rule, in teaching finger-action the problem has been to devise some method of holding (or " anchoring ") the hand so as to get as free a movement of the fingers as possible. The old way was to hold the arm rigid with the hand in a stereotyped position, and then to " peck " at the keys with the fingers. This method immobilized the use of arm-weight in finger-action, and at the best of times (particularly when the " peck " became a " hammer-blow ") resulted in hard tone, and always was handicapped by arm-rigidity. On the other hand, the apostles of the weight-school advocated the shifting of the weight of the arm on each finger in turn, each following finger superseding its predecessor without any pronounced finger action. While this method secured the continuous use of the weight of the arm, the rigidity was not avoided, but merely shifted. For each finger, as it supported the weight of the arm, remained in a position of rigidity, acting merely as a prop of the weight instead of the weight being swung naturally *in combination* with finger-action. This method of transference of the weight may be effective in a few extended bravura passages, but the lack of any semblance of finger-action, due to wrong practice in the commencing, slow stages, militates strongly, almost fatally, against clearness and brilliancy. If we adopted this method in walking, the result would be a stiff strut, the body remaining rigid, and progress resembling that of an automaton whose legs moved on a hinge from the body. At best each step forward would be a spasmodic one, almost a stumble. In applying the point mentioned above, that of *swinging* on the supporting fingers, as on the feet in walking, to the problem, the questions of finger-action and flexibility will resolve themselves.

The following examples deal with various points already raised in this chapter.

Example 1 is a suggestion for training in finger-action.

Example 2 contains, in its reference to the relaxation at the point of contact, the preliminary consideration of the departure from the point of contact; this point, as will be seen, comes in reality under the heading of Relaxation, and the chapter devoted to this part of the subject will supply the remaining details.

Example 3 is a study in balanced fixation.

Example 1. (See Figs. 13, 14, 15.) Instead of rigidly supporting the weight of the arm on the sustaining finger (in this case the 3rd finger), let the weight be lifted, partly by the muscular action of the shoulder and the flexibility of the wrist, and partly by pressing against the supporting finger. This will result in the partial straightening of this finger (which, however, should not leave the key) owing to its being used as a pivot (in the same way as the backward foot in the act of walking): in the meantime raise the acting finger (in this case the 2nd finger), having it poised ready to strike: as it descends, the weight of the arm, being already in motion from its swinging action—and not rigidly poised—is ready to add its impetus to the blow of the descending finger, and the conditions of contact and anchorage are carried out as before.

Observe here the very important point that the finger is raised *before* striking, not afterwards. All fingers, once they have finished their action, should be relaxed, and completely inhibited from any interference with the others.

It is vital to remember that this exaggerated method of striking should only be used in the preliminary stages of practice as a gymnastic exercise in correct finger-action. All movements, as control and swiftness develop, are gradually reduced in their extent, since they become merged in the general scheme of co-ordinated movements: but it is a mere obvious fact that no co-ordinated movements can ever be swift and efficient unless the details of which they are made up are grappled with and mastered.

PLATE V.

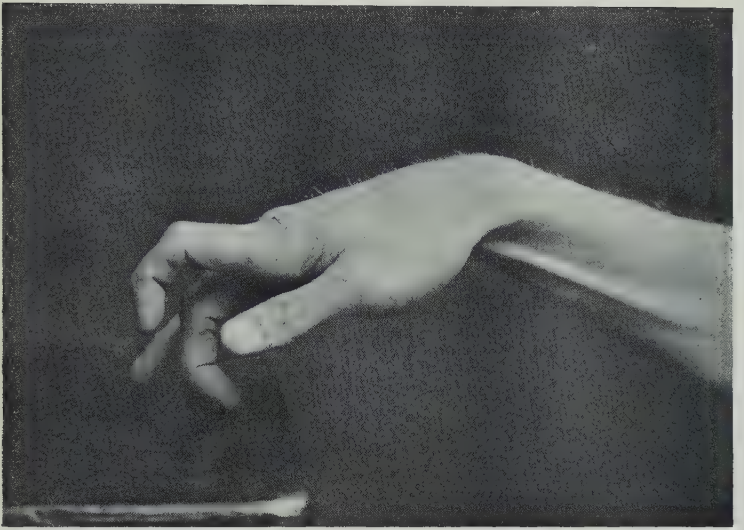


Fig. 13.—Showing beginning of finger stroke.

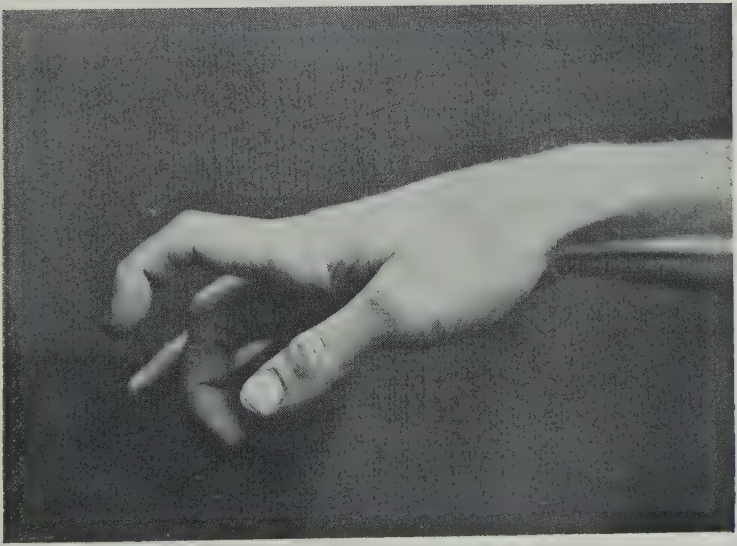


Fig. 14.—Showing continuation of same stroke.

PLATE VI.

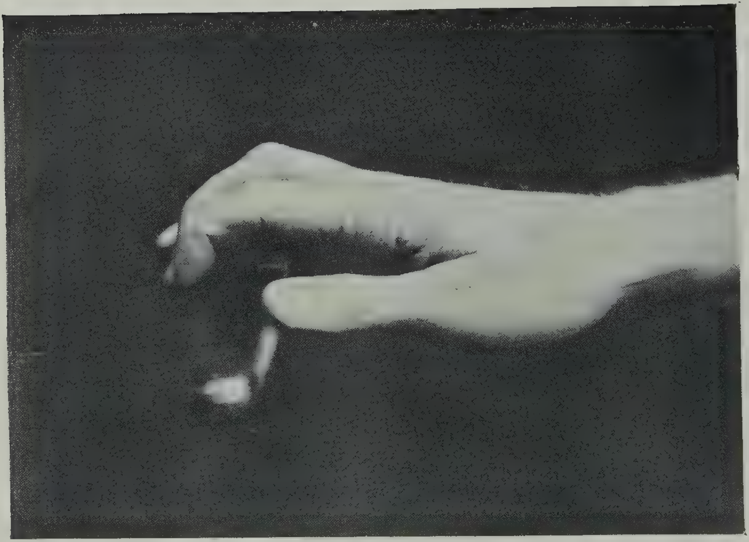
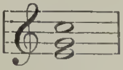


FIG. 15.—End of stroke (point of contact).

Example 2. **Departure from the point of contact.** Hold the arm suspended above the keyboard, with the fingers prepared to strike any chord, taking here, for example, the chord:



The fingers must be in a state of readiness, not stiffened, but alert, prepared to take the strain of the descent of the weight on to the keyboard, remembering always that their *contraction comes as the point of contact is being established*, not before. The hand should be held loosely in the wrist, and the forearm swinging easily in the elbow-joint. Any effort to stiffen the fingers beforehand (through anxiety lest the right notes should not be struck) must be definitely checked, as it will only result in stiffness and probably hard tone. Practice and courage will soon train the student to aim at (and grip at the right moment) the right notes.

Allow the whole arm to fall, by releasing the tension of the shoulder muscle, but not *completing* its relaxation until the moment of repercussion from the blow. This repercussion should be taken up by the three fingers concerned, in combination with the flexor muscles of the arm aided by the flexibility of the wrist, all of which are contracted to meet the strain of repercussion.

The analogy given above of the resiliency of the cricket bat or golf club now arises here in a particularly apt form. If the muscles are kept in a state of resiliency, not only is the jar of the blow eliminated but such resiliency enables the speed of muscular action to be unimpeded by the contact. This problem is met by the protagonists of full relaxation by advocating relaxation before and during this point of contact. They maintain that the fully-relaxed arm falling on the keyboard produces the right kind of tone. This is quite wrong. Experiment will show that it produces a thud, just as in walking a fully-relaxed leg would produce a jar to the body and a stagger or "flop" on the ground. The truth is that the contracting muscles should not be at full rigidity at the critical point: they should be in a state of resilience, so as to have the same effect of speed and flexibility of the cricket bat or golf club. *It is at this point that relaxation of the flexing muscles begins.* The " sensing " of this act of resiliency is the beginning of the act of relaxation, which continues if the chord struck is a final one or at a sufficiently large interval from the next one to allow of time for such full relaxation. In swift chord-playing the resiliency is used as a connecting link with the physical effort of playing succeeding chords; this leads to the practice of the vibrato as used in advanced technique, which is dealt with later. The full relaxation corresponds again with what is known as the " follow through " in cricket, golf, or tennis, or any similar example of physical action. The accurate timing of the stroke, and the swift resiliency and recovery (both in isolated actions and in combined actions) are in the end matters of advanced nervous training; they constitute the highest aim of technique, and should always be taken into account when studying any technical problem.

Example 3. Hold the arm above the keyboard as before. Instead, however, of letting it fall by a swift relaxation of the shoulder muscle, let it descend slowly under full conscious control of the shoulder until the point of contact is reached.[1] Continue the fully-controlled movement right through the point of contact, taking the muscular re-action *en passant* as it were. This continuous movement is an advanced form of touch control. The point to remember is that the whole arm is the instrument of operation, not any one part of it. In the previous example the impetus once initiated from the shoulder proceeded through the arm until it culminated in the ends of the fingers. It was as if the arm were a rope lying on the ground, and one end of it had been set in motion, the motion continuing in curves to the other end of the rope. In this example the arm is not like a flexible rope, but a rigid mass, the flexibility lying in the operating muscle, viz. that of the shoulder. This form of touch is used when strong control is necessary, especially in delicate work like " pp " passages, and in special technique like that required for forearm staccato. This is again another instance of the spreading of the anchorage over the whole arm: but in this example it is as if the movement *started* as a double anchorage and continued so throughout.[1]

---

[1] This is an illustration of what was said concerning use of whole-arm movement under Balanced Fixation. See p. 57.

Example 4.[2] Examples 2 and 3 were illustrations of the impetus of the weight of the arm, gathering speed as it descended. This example is one of the use of muscular energy.

Hold the arm poised with the fingers actually on the keys, using the same chord. Suddenly relax the shoulder muscle, and at the same time thrust the arm vigorously forward with its extending muscles (the triceps and pectoral muscles; see Gymnastic exercises, Shoulders 1 (*b*)). This muscular effort imparts the necessary energy to the arm equivalent to that imparted by momentum in the previous examples. The repercussion at the point of contact takes place in the same way as before, the muscles proceeding immediately from their thrusting effort to that of taking the repercussion. Resilience is made more use of here, as this form of attack is the only one possible in swift chord-playing.[3]

The examples given are elementary illustrations of the demonstration of the basis of the act of touch. Briefly stated, the act of touch has its three demonstrable sections: in the first, the approach section, the control should be as far back in the forearm, or upper-arm, or shoulder (as the case may be) as possible, the action being a swing of the operating member, be it finger, hand, or forearm, from its own anchorage. This swing is controlled by the big muscles of the arm, the smaller ones (those controlling the operating members) doing their own work *within* the impetus of the larger ones, and all coinciding at the point of contact. Mere relaxed dropping of the hand or arm is simply negative, producing poor tone and no control: on the other hand, stiffness in the operating members is equally pernicious, leading to hard tone and the use of unnecessary muscles. All should be a uniform and steady movement, carrying out inexorably the original muscular conception. Further, this original muscular conception is the most important matter of all, as we shall see when the question of "intention" is discussed.

---

[1] It seems a paradox, but it is nevertheless true, that the greatest power needs to be exercised for the extremes of tone, for "pp" as well as for "ff." Those who saw Busoni playing the 20th Prelude of Chopin will remember that he played every chord throughout with a movement of his whole body, swinging from the hips, the arms and shoulders being rigid. He secured a terrific "ff" by the speed of the movement of this heavy mass: and he used identically the same movement for his "pp," moving at a much slower rate of speed. The whole was a fine example of complete control.

[2] See Method 2, p. 56.

[3] See Chapter XI.

The right conditions in the first section are bound to result in the accurate attainment of the conditions necessary at the second section, viz. resiliency at the point of contact: and resiliency there must inevitably lead to right conditions at section 3, viz. the beginning and carrying out of real relaxation at the right moment and in the correct way.

Varieties of tone depend on variations of speed in the descent of the key. These variations are controlled by muscular power, not by any special position of the hand.[1] The inception of speed is made by a nervous impulse given to the muscles: the quality of tone in every variation depends on perfect timing at the point of contact. The muscular organism is never fully contracted until the point of contact is reached: and all is in a state of nervous preparation for that point. Stiffness in playing arises from too much contraction beforehand—nervous tension and fear of weakness at the critical moment: too much relaxation before this moment, on the other hand, leads either to flabbiness or to hard, thumping tone. True suppleness lies in securing the full contraction at the right moment, neither before nor after: this constitutes *perfect timing*. Finally, at the point of contact the muscles are not in relaxation at all, as advocated by the devotees of relaxation: on the contrary, they are in contraction, but resilient, preparatory, if necessary, for relaxation, but most frequently using their resilience to carry the arm to its next movement.

---

[1] The device, for instance, of using "flat" fingers to secure what is called cantabile touch is a case in point, and shows the absence of sufficient observation of the conditions. This cantabile touch can be secured by keeping the hand in its natural shape: the condition for achieving the quality required is that the fingers shall be in *one co-ordinated piece* with the forearm (a variant of Example 4 above). That this co-ordination can be better achieved by keeping the fingers flat is arguable, but to say that flat fingers are the cause of the final effect is erroneous.

This long and detailed analysis, admittedly difficult to grasp, as it has been not easy to demonstrate, is given as an example of the kind of detailed observation which the student must undertake, if he is to attain technique which will remain permanent, which only true knowledge will give him. If he will master this system of analysis by continued study, applying his study to the observation of his own playing: if he will, moreover, study conditions of natural movements in walking or any other forms of movement, as outlined in the above analysis, the solution of this great problem will cease to present difficulty. Mechanical repetition, without deliberate employment of the conditions ascertained by preliminary knowledge, is worse than useless: it is tiring and dull, it drives all the music away from the most enthusiastic, and in the end does not secure the purpose of permanent achievement.

Finally, the never-failing test of right conditions of technique is that of good tone. All the great teachers have been unanimous and insistent in exhortation to their pupils to train themselves to listen to their own playing—a really difficult art. In his efforts to achieve this faculty of criticizing his tone, the student should be guided as much by his physical sensitiveness as by his ear; indeed, the former may be considered to be much the more important. A hard tone produces a hard repercussion on the fingers and arms,[1] and therefore such a result, carrying as it does a feeling of physical discomfort, signifies that wrong physiological conditions are present. There may have been a flaw in the initiatory movement : perhaps a mistiming may have occurred at the point of contact, with consequent failure to secure resilience : or the fear of playing wrong notes may have intruded itself at the last moment and caused a break in the continuity of the swing of the action. All these things are apt to occur : and they take place in a fractional moment of time ; but the trained player should be fully conscious of those moments, swift though they be. Far from having to wait to test his result until after the tone has been made, he should train himself to *know beforehand*, after the beginning of his action, what his tone is going to be.

---

[1] The question is sometimes asked: Why should a stiff blow produce a hard tone, since the hammer, acting through an escapement, can only momentarily strike the key, and not be *pressed* into it?

The answer to this is that even though the blow of the hammer be only momentary, yet that momentary blow may contain a pernicious set of vibrations, communicated to it by faulty treatment of the key. In hitting a nail with the ordinary domestic hammer, the hammer will rebound from a sharp, well-timed tap; but if the hammer be held stiffly and pressed it will make a series of jarring vibrations. It should be noted that the hammer does not remain pressed on the nail: it rebounds, the said vibration being a *series* of rebounds, and it is this series, as opposed to a single rebound, that causes the unpleasant effect. So it is with the piano-hammer when it is wrongly treated: it rebounds not once, but many times, even in the fractional space of time, and these rebounds, or pernicious vibrations, have originated in the stiffness of the unresilient hand which delivered the blow, and they are communicated even through the escapement mechanism to the hammer.

The cultivation of this inward physical sensitiveness is the secret of all successful results, not only in piano-playing, but in all actions that involve " timing." The ring of the blacksmith's hammer, the " conk " of the cricket bat or golf club, the " song " of the tennis-racket, are all instances of the result of fine timing : but if any one of the wielders of these weapons were asked how he cultivated his timing skill, he would be unlikely to reply that he always tested it by the sound. He would be far more likely (the majority of *him* at any rate) to say :—" Oh, it's just a knack." " The inner sensitiveness of anticipatory resilience " may be given as a definition, clumsy enough perhaps, of this universal and, to the novice, discouraging cliché of the skilled craftsman. Moreover, it cannot be acquired without carrying with it, consciously or unconsciously, perfect physiological conditions (the genius already possesses it : the plodder can achieve it, if he uses his knowledge, and will probably harness it with more certainty than the genius). So it is with tone on the piano, and the purpose of the sub-heading of this chapter has been to drive the point home.

In time, the great pianist makes his own technique, after he has left his " school " behind, and this technique is part of his being, and becomes part of his interpretation. The act of touch is the physical expression of his aesthetic feeling : the greater the ease and resilience of his physical movement, the more spontaneous and warm his playing : for, having formulated his conception, he *knows* that he will secure the effect he wants, and the tone he desires, and this is, after all, the philosophy, psychology, and physiology of technique.

CHAPTER VI

THE UNDULATORY WRIST MOVEMENT

Among many questions which have exercised the minds of teachers, that of the undulatory movement of the wrist in all phases of technical work has always had great prominence.

From the earliest period of pianoforte playing the great players recognized and practised this supple movement of the wrist. It seems extraordinary now to realize that up till quite recent times controversy raged concerning the position of the wrist in playing: one side advocated the low position, others the high position. With the example of the great players before them, with their supple wrist movements, it would seem that they could not fail to see that the combination of the two was the solution; but if we remember that the pianoforte was taught from the point of view of keeping the arms still and performing most of the movements with the fingers and hands, and that, from that standpoint, all teachers had in mind the best possible position for such use of the fingers, we are able to understand the controversy. Knowing little or nothing of the use of arm-weight, they used their powers of observation, while watching great players, in the light of the only knowledge they possessed, that of the theory of finger-use above-mentioned. They were further handicapped by the belief that great pianists were the product of the methods by which they had been taught, a mistake made even at the present day. Liszt was a great pianist: Czerny was his teacher—probably using a system of rigid finger exercises: therefore the Czerny method must be the right one. No one seemed inclined to believe that close observation of Liszt's methods would have shown that he could not have played as he did if he had followed blindly the Czerny teachings. This is not to say that Liszt did not profit by his lessons with Czerny : on the contrary, he may possibly have acquired power and strength in his fingers by means of the practice of the exercises : he certainly must have benefited from the discipline of a great teacher, and his natural genius did the rest, saving him from the harmful results that lesser men suffered under similar tuition.

To return to our subject, it was later considered that the undulatory movement of the wrist eased the strain on the arm and hand in difficult and prolonged octave passages as in Liszt's 6th Hungarian Rhapsody, or in his arrangement of Schubert's "Erl-King." Kullak, in his *School of Octaves*, recommends this practice of undulating the wrist, giving, as his reason for doing so, this easing of the strain.[1] This explanation represented at any rate a step forward in thought on the subject, and in time resulted in the almost universal adoption of this method of wrist movement, and there is no doubt that such movement does act as a corrective to stiffness, since it is impossible to hold the arm in a state of stiffness if the wrist is kept moving in this supple way.

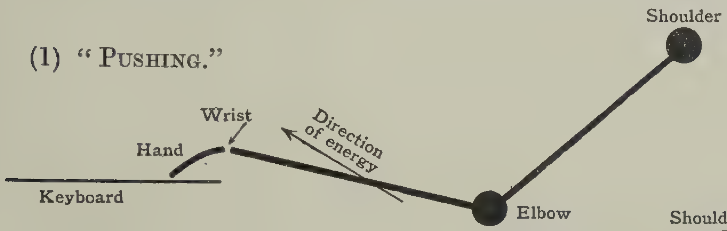
The advent of the system of weight-application did not add very considerably to further development of the matter ; but Breithaupt, in his method of High-Fall and Low-Fall of the wrist throws further light on it. If, however, we apply the knowledge of physiological conditions to consideration of the question, it will carry us still further, if not to complete solution. Study of the foregoing chapter will have demonstrated that at the point of contact, the position of the wrist is more or less horizontal : in the "follow-through" it was assumed that in relaxing itself the wrist dropped below the horizontal. In our investigation of this question of the undulating wrist, we shall find that the same effect of following-through can be obtained by making the wrist rise upwards as well as drop downwards, with great benefit, in advanced technique, not only to suppleness, but also to economy of exertion. For purposes of nomenclature, the dropping movement may be spoken of as "pulling," and the thrusting upwards as "pushing."[1]

---

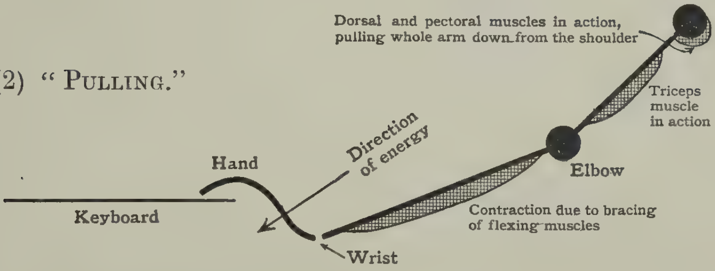
[1] See p. 115.

The following diagrams will show how the wrist is affected by these movements:

(1) "Pushing."



(2) "Pulling."


Shoulder
Dorsal and pectoral muscles in action, pulling whole arm down from the shoulder
Triceps muscle in action
Direction of energy
Hand
Elbow
Keyboard
Contraction due to bracing of flexing muscles
Wrist

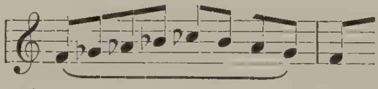
If we analyse the physiology of "pushing" we find that the inception comes from the shoulder (deltoid) muscle lifting the arm slightly forward, the triceps muscles joining in the extension of the arm in the direction of energy. The wrist naturally arches, and the extensor muscles and tendons of the forearm (those which pull the *hand* upwards) are stretched over the arch of the wrist by this movement and act in regulating it, and, if necessary, controlling the over-arching. They act also as a brace or support for the contact of the weight of the arm with the keyboard: the flexor muscles of the forearm (those which pull the *hand* downwards) act also as a preventive of over-arching, in so far as they must function in their work of supporting the resistance at the moment of contact.

In the "pulling" action, the inception comes from those muscles (the pectoral and dorsal) which pull the arm and elbow downwards. The triceps acts as before to extend the arm, but the direction of energy is downwards, the wrist naturally follows this direction and sinks downwards, the forearm flexors being relaxed to allow this to be done unimpeded. The flexing muscles of the forearm operate at the same moment in checking the downward fall of the wrist, and as a buffer taking again the strain of the contact.

---

[1] These are only terms of convenience for purposes of this discussion: the writer has a profound dislike of anything in the nature of "jargon."

We thus have the two ways of regulating the direction of the weight of the arm. In both ways it will be realized that there is a slight difference in conditions at the points of contact. In Chapter V this point was premised as being at the point where the wrist is horizontal. In these two cases (and their variations) the points will vary accordingly, with corresponding variation in the tension of the muscles concerned in repercussion. It is conceivable, for instance, that at the low-fall, the repercussion will act, not against muscles, but against tendons and ligaments, if the wrist is at its extreme fall. Conditions of this kind, however, will very rarely require special treatment; and, in any case, they can be dealt with under the general theoretical facts already adumbrated. A little thought will show that these two main ways (they are naturally capable of variation and graduation) may be used alternatively, the end of one movement acting as the starting place of the other. Further, the movement from one to the other may be spread over groups of notes, especially in cases where the contour of the keyboard demands a readjustment of the position of the wrist. For instance, in the passage:



it is obvious that the low position of the wrist throughout would prevent a comfortable execution of the black notes: the high position would offer difficulties also. The solution lies in using the combination of the two. If we begin with the low position on F, and begin to raise the wrist from that point, we can make for C flat as the end of this raising movement, taking G flat, A flat, and B flat on the way, in our stride, as it were. The movement is reversed in returning to F, the whole producing the undulating movement of the wrist, which is the subject of our investigation. This is a simple illustration of what takes place in the playing of all kinds of intricate passages in pianoforte playing : and such movement of the wrist is instinctively adopted by the great players who have the physical genius to go naturally for the easiest and most supple way of playing any difficult passage.

It is now possible to get a little nearer to the explanation of these undulatory movements. They are a development of the "departure from the point of contact" mentioned in the last chapter. If the wrist, in the "relaxation" or "follow-through," were always allowed to drop downward, it is obvious that in order to get a new arm-stroke the whole arm would have to be lifted up again in order to do so. The use of both "pulling" and "pushing" enables a start to be made from each extreme, each stroke-ending being the beginning of the next, as demonstrated above. This secures economy of exertion and movement. Again, by exercising control of timing and cultivating sensitiveness of feeling of points of contact, it is possible, and ultimately easy, to have a series of points of contact contained in one comprehensive downward or upward movement of the wrist, the wrist being the regulator, controlled by the muscles of the arm which perform the pushing or pulling. In other words, the wrist-joint acts as a "guide" through which controlled movements of the arm and fingers can operate, the "clearing-house," so to speak, of all the intricate and combined muscular movements of the arms and hands. Suppleness is bound to ensue, since a stiff wrist, or even a wrist which is held straight without conscious stiffness, would be an impediment to free movement of the arm. The important points are these :

(1) That this wrist-movement supplements and facilitates the movement of the muscles of the shoulder as well as those of the arm, and far from being only the means of keeping the wrist supple, it is the only way of enabling the player to use the *whole arm* freely. Indeed the upper-arm muscles provide the machinery, and the wrist is the channel through which the machinery operates : and the student should continually practise

the power of feeling the muscular action in the upper-arm while keeping the wrist and hand supple.

(2) That the wrist is used as a means of breaking the rigidity of the "double anchorage" so often referred to. When the wrist is relaxed in this way, the arm can begin to prepare itself for the next stroke, and the hand can at the same time be free to swing on its own single anchorage. It is possible indeed for the hand, being lighter, to swing several times to every one swing of the whole arm from the shoulder. The development of this possibility results in the use of vibrato (see Chapter XI). The wrist is not always in the passive state of suppleness that appears to the observer: very often the undulatory movement is deliberately adopted, the muscles of the forearm (referred to above as controlling the arching and flexing of the wrist) being in a state of controlled tension steadying the wrist in its up and down movements.

Finally this wrist movement, especially in the pulling-down action, is used in chord-playing to provide the resilience in the arm shown in the last chapter to be such an important factor in producing good tone and sound technique.[1]

In practising this movement, therefore, the student should bear in mind that the wrist is used to promote suppleness, but that the suppleness is that of the whole arm controlled by the shoulder, the flexibility of the wrist (and indeed also of the elbow) being not a mere aimless passivity but the means which enables the whole arm to function freely.

[1] There is an interesting natural experiment, which may possibly be used as an argument in favour of the low wrist in finger passages.

Let the hand be held out in line with the forearm, with fingers extended: then clench the fist. It will then be observed that the back of the hand comes back at an angle to the forearm, no longer being in a straight line with it, thus showing that the extensors of the wrist naturally tend to take the strain from the flexing action of the fingers. The experiment can be varied by trying to prevent this backward movement of the hand: this will cause a feeling of extra strain on the flexing fingers. In any gripping action, the hand always comes back on the wrist.

It may be reasonably inferred from this that finger action can be facilitated by keeping the wrist low so as to allow free play to this tendency of the hand to come back.

The author has certainly found it useful in playing brilliant finger passages which require vigorous treatment.

CHAPTER VII

THE RELAXATION FALLACIES. THE PSYCHOLOGY OF RESILIENCE

A GREAT deal of misunderstanding and—it must be said—nonsense has been written and taught about relaxation.

The classical master at the writer's old school, given to fits of justifiable annoyance with his refractory pupils, once declared in a particularly trying Latin construing lesson that " res " *never* means " a thing." This, in face of the printed evidence to the contrary, came as a shock to the rigid, vocabulary-haunted minds of his pupils, and they naturally put this almost blasphemous statement down to perversity and irritability.

It is probable that modern pianoforte pedants will throw up shocked hands on seeing the heading of this chapter. And yet it is safe to say, with, it is true, a qualification, that there is no such thing as relaxation in pianoforte playing : the qualification being " as at present taught and understood."

Relaxation is *not* a negative action but a definite and positive muscular function. The term as at present used is another instance of the use of an expression to secure a definite physical condition without sufficient data to define what that condition is. It has certainly served its purpose in the sense that its use has turned the minds of pianists away from the stiffness and rigidity of the old schools : the general, though not entirely accurate, idea of the condition it was intended to designate makes it easier to inquire into the nature of the condition, and, if possible, to find a new and more accurate definition of it.

Let us investigate the simplest form of weight-movement—the whole arm descending to play a chord on the piano. We find the adherents of relaxation advocating the unimpeded descent of the arm on to the keyboard. If the arm were to be allowed to descend on to *any* part of the keyboard, without respect to any definite notes or to any quality of tone, the relaxationists would be right: but then, the piano is not intended to be played in this way. In analysis, it is obvious that some sort of *control* must be in operation to ensure the right notes being played: this consists in keeping the arm moving in a direct line towards the objective. By taking the analogy of a stone dropped from a height by the hand on to a definite spot on the ground we get a clear illustration of what is required. In this instance, the hand must necessarily be held in a controlled position to avoid deviation laterally or longitudinally from the line of objective. The slightest departure from steadiness will ruin the result. How is this steadiness secured? It is secured first by the shoulder muscles steadying the whole arm, and then by the various muscles in the arm down to the fingers themselves. Whether it be muscular contraction exercised to the extreme degree, or, what is better, the minimum of muscular control, or, best of all, the elimination of muscular vibration by nervous control, one of these factors must be in operation, and all of them connote some sort of fixation (whether nervous or muscular), certainly not relaxation.

The next step is the dropping of the stone. The relaxationists will argue that here, once the stone is released, it falls by its own momentum unimpeded by human agency, and that the same thing must occur in allowing the arm to drop on the keyboard. Again, the piano is not played in this way. Apart from the fact that the arm is a living organism, liable, even in the case of the most highly developed nervous and physical organisms, to aberration from perfection in action, the result can never be satisfactory. The stone drops dead, and at a constant speed, whatever the weight of the stone, as Galileo proved. If the piano were played thus, all tone would be uniform in its quality, and harsh to boot. At the moment of striking the keyboard the control of the arm *must* be in operation in order to meet the force of inertia described in Chapter V, and to regulate the resilience of the muscles in order to achieve the quality of tone desired. At what point in the descent of the arm should this control begin ? Is it not a waste of energy to relax control only to take it up again before the imparted momentum is completed ? Surely it is better to keep control *throughout* by means of adopting the state of nervous preparation like that mentioned, for instance, in Chapter V.[1] It is the preservation of this alertness throughout, unimpeded by involuntary extraneous movements, which *leads* to real relaxation.

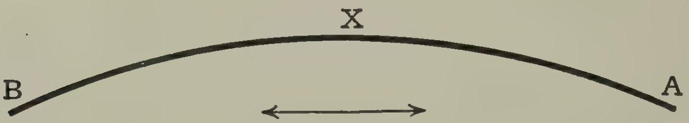
Let us return again to the dropping stone. In the first attempts at this experiment, it will be found difficult, at the moment of release of the stone, to avoid an involuntary upward jerk of the arm : the ability to release the stone by merely relaxing the grip, without any extraneous nervous movement, will require a certain amount of practice and concentration. In like manner, once the mode of striking the keyboard in a particular case has been determined, the muscular and nervous control must be confined to that, and all practice concentrated on the avoidance and elimination of extraneous and involuntary nervous movements. This is called *inhibition*, and it is this which has often been taken mistakenly for relaxation. It is the consistent maintenance of the *intention* throughout the movement from its mental conception and nervous initiation to its physical culmination which constitutes true freedom and suppleness in any act of touch. Any break, or nervous impediment in the process of the act, once it is launched, constitutes stiffness and opposition to free movement. The setting in operation of hostile muscular and nervous movements is the real cause of stiffness, since it sets up friction, which in its turn leads to cramp.

The question of *intention* may be elaborated here. It is a habit among many modern players, particularly among those of the relaxation school, to turn and twist their hands (after the manner of a violinist or a 'cellist playing " vibrato ") on a key that has already been struck, as if coaxing a little more resonance out of it. To the ordinary observer it may sometimes appear to have that result, despite the fact that to any thinking person it is obvious that, once the key has been struck and held down, no amount of pressure or otherwise can affect the tone: and there are not a few players who avow that such a practice *does* make a difference to the tone. It is another instance of confusion of thought; the subsequent discussion will explain the phenomenon. Another analogy, this time taking the follow-through of a stroke at lawn tennis will help to clear up the matter.

---

[1] See p. 60, Analysis of walking, and also Balanced Fixation, p. 57.

Quite reasonably the question may be asked: "Why should one 'follow-through'? The ball has been struck and is on its way: nothing can be done to it by any further movement of the racket." The following illustration furnishes an answer to the question:



Let the curved line *AXB* represent the path of the racket in striking the ball, *A* being the starting point, *X* the point of contact, and *XB* the "follow-through."

The point of contact should be the place where the racket reaches its greatest speed (or energy), and also it should be the point where the energy begins to diminish towards vanishing point. Obviously, this point *X* cannot represent the *end* of the stroke, for if so, it would mean either that a check must have been put on the momentum of the racket somewhere between *A* and *X*, so as to bring the racket to a dead stop at *X*, or that the point of maximum energy must have been reached between *A* and *X*, and *X* represents the vanishing point. Either of these contingencies is absurd if the maximum energy is to be at *X*. A follow-through *beyond X* must therefore be necessary, and—here is the answer to the question—it is the *intention* to follow-through, the determination not to relax the energy until after the point of contact has been reached, and equally the determination to relax from that point which constitutes the good stroke. *The above-mentioned vibration mannerism is merely the outward and visible sign of previously-*

intended resilience, and, in a similar way to the lawn-tennis stroke, it is the *intention* to exercise this resilience, such intention setting up the necessary conditions in the arm, which produces the good tone and ensures right physical and technical conditions. It presupposes balance, absence of rigidity, and freedom of impulsion towards the key. This resilience marks, as we have demonstrated already, the *beginning* of relaxation: the intention to exercise it is the criterion of the act of touch, and in no instance should it be mistaken for the *act* of relaxation. True resilience (a better word, though perhaps not so descriptive) lies then, in eliminating (or inhibiting) all movements (voluntary, as in the case of forcibly checking a movement after its inception, or involuntary, as in the case of nervous counter-impulses) except those that are determined upon as necessary to the performance of the action of allowing free swing to the movement once started, but keeping nervous control of it: of concentrating the mind on the point of contact, and above all, of *diminishing* the effort once that point has been reached. Diminishing does not mean relaxing: the latter is the completion of the former, and absolute relaxation cannot occur in continuous playing or in any continuous physical effort, as we shall see in a moment when we come to the psychological aspect of it.

A particular instance of misunderstanding in the use of relaxation occurs in the teaching of staccato playing. It is maintained that all that is necessary is the release of the key by relaxing the finger or hand as the case may be. There are two misunderstandings involved here:

1. The depression of the key by the weight of the hand in wrist staccato is caused, so it is said, by the relaxation of hand weight. If such is the case, then the release of the key must involve a contraction of the extensor muscles to lift the hand up again. Hence the so-called key-release involves a muscular contraction of extensors, not a release (as it would otherwise be) of flexing muscles.[1]

2. With regard to finger-staccato, while the relaxation of flexing muscles is obvious here (since the key has been depressed

---

[1] It has been argued that the flexing muscles *are* released and that this is secured by the further dropping of the wrist. Surely this is an unnecessary complication.

by finger flexion: finger-weight by itself has not been in action, since finger-weight is insufficient to depress the key), the action involved in such a process, a "pecking" at the key, is slow and even ponderous when dealing with swift staccato passages. It is an instance of carrying a theory to absurdity.

Swift staccato passages are achieved by a *series* of movements, admittedly of a free, and even relaxed, hand, initiated by the vigorous contraction of muscles in the arm. One has only to play a staccato five-finger exercise in both ways (at a swift speed) to be convinced of the absurdity of the former, and to realize that the latter way is the obvious one.

"Res" does sometimes mean "a thing": there is such a thing as relaxation. The mistake which has been made has been to put relaxation in the wrong place (viz. where resilience should come), making use of it as a means, instead of being the ultimate result, of a good stroke. And yet it must not be forgotten that any correct action must, if carried to the vanishing point, lead to relaxation, that is to say, that relaxation is only the result of correct action. In no sense can it be a permanent condition in playing. Playing the piano is like all physical movements, a matter of poise and balance: and poise and balance are active, not passive. The best illustration to take is that of the animals of the cat tribe. Observation of these animals reveals an unexampled grace of movement, all *apparently* relaxed, but in reality perfectly balanced, with no superfluous spasmodic movement. And yet no animal has greater speed and swifter re-action. A cat crouches before the mouse, apparently in complete relaxation and languid negation of movement: but if the mouse should move, the paw shoots out, swift as light. This capacity for such amazing speed is due not so much to muscular power as to the state of perfect nervous preparation. All being in repose, there are no extraneous muscular contractions or nervous tensions to eliminate before selecting the right muscles with which to work: such a thing would entail delay, and induce slowness of movement: the cat starts, so to speak, with a physical "clean slate." It is this repose and, at the same time, readiness which is the true condition which the relaxationists are aiming at.

It is not relaxation: it cannot be, since relaxation after every effort means that each effort is in a compartment by itself; and here we are at the very difficult psychological consideration of the problem. All must be fluid, always moving and changing, as Bergson says of existence itself. The bridge between each effort in a series of efforts should be a nervous one: each effort, and indeed each series of efforts, may be diminished to the minimum without being complete and absolute: there is a point where physical relaxation may be apparently complete, and from that point to absolute relaxation the nerves are in control, smoothing out the momentum, as it were. In this period, intangible in time, but definite in feeling, the reflex actions built up by instinct and training have their function, serving as a bridge to the next physical effort. The more one strives to develop reflex actions and groups of reflex actions—and this can only be done by practising with full consciousness of the source of control of physical movement—the wider can this bridge between physical relaxation and absolute relaxation be made, and movement be made easier and more supple, because the consciousness of this bridge or gap is more fully realized. Every effort can be timed, since spasmodic movement is eliminated, and ultimately even the most complicated movements become almost subconscious and yet not involuntary even in their details. Continuous mechanical repetition may set up a false structure of this kind: it may possibly be propped up by an unconscious, unrealized physical or nervous spasm somewhere, a flaw which only makes itself felt when the false structure is called upon to support some other new technical difficulty: the structure then falls to pieces, and all is to be done again, often repeated to the point of despair and abandonment. Leaving the metaphor, *all playing consists of a series of impulses which contain reflex actions set in motion by those impulses, and forming a bridge to the next impulse.*[1] The so-called relaxation, which is really resilience, lies in the non-interference with these reflex actions. It may be that brute physical force and will-power will enable the passage to be played even at the cost of impeding and interfering with these reflex actions: but passages mastered in this way have no permanence—the bridge is bound to break down under the strain. The true bridge, or structure, constructed by concentration on the real physical requirements, and the elimination of unnecessary physical and nervous movements, will stand the pressure of everything that is brought to bear upon it: all conquered difficulties can be piled upon it, and be called upon at will. Herein lies permanence, and furthermore, here is the real meaning of the axiom that technique is in the long run mental: and the maintenance of the fluidity of that bridge (to continue the metaphor) in its resilience and nervous movement, without in reality reaching its vanishing point, relaxation, is the true solution of the great problem of suppleness and ease in playing.

---

[1] A further illustration of this is given in Chap. XI, p. 122.

CHAPTER VIII

CONTRACTION AND FIXATION

The Relaxation theory has undoubtedly played a great part in liberating students from the thraldom of the old-fashioned method of training the hands: it has succeeded in establishing to a large extent the power of muscular discrimination, a department of technique hitherto unexplored: and it has certainly enabled many more students to advance farther along the road of achievement in the direction of tone-production and facility of execution. On the other hand, it has suffered the fate of most innovations which appear to be of the "royal road" variety, in that it has increased the number of second-rate technicians who, under the old schools, would never have had the stamina to survive the gruelling training and to have achieved high standard, as the great players did, in spite of the drawbacks of this training. There is no evidence among the present generation of players trained under these "free" methods, of the attainment of the stupendous technique of players of the stamp of Anton Rubinstein, Paderewski, Rosenthal, Rachmaninoff, and Carreno. One could go further and assert that the principal failing at the present day is the lack of authority and firmness in the higher regions of playing, both on the technical and interpretative side. Students are taught to move in so relaxed and flabby a manner that their playing is bound to lack edge and snap, and the superb nervous force and dynamic energy, even in softer passages, so characteristic in the playing of great artists of the type mentioned, is almost completely absent.

The reason is not far to seek. We can to a certain extent set aside such specious arguments as that the modern tendency is to attain as much as possible with the least possible effort. Such an argument is not peculiarly applicable to the present day: the weakness has been inherent in the human animal since the first specimen was produced: but always through the ages there have been outstanding men and women who have been ready to achieve the utmost, and always their experience has been that utmost achievement only comes from utmost discipline and effort. The argument that the great masters of playing are such because they are born to be great, and are independent of methods, is a fair one to advance: but it must be met by those of us who are teachers by the reply that our object is to make as many great masters as we can, since the object of all education is not an *ad hoc* one, but the attempt to raise the genius of the human race to the highest possible attainment.

The former of these two arguments cannot, however, be wholly dismissed. The tendency of the educational methods of the present day is undoubtedly in the direction, willy-nilly, of the avoidance of rigid discipline, and the lightening of the task of the student by "easy methods"; consequently, no call is made on the power of extreme tension of the human organism, and this power becomes atrophied from lack of demand on it. The result has been, at any rate in the domain of instrumental technique, that, while the standard has been perhaps raised from the bottom, it has been distinctly lowered from the top, and no serious thinker can deny that, in so far as the existence of many living exponents of the highest attainment seems to be lacking, the incentive to effort is wanting; and he is driven to the conclusion that the system must be a retrograde one. The fault lies not only in the decline of mental and moral effort, but equally so, with regard to the practice of executive artistic work, in the decline of physical effort. Indeed, it can be said that the former is a corollary of the latter. It is reasonable to put forward a hypothetical case.

A promising young pianist is placed under a teacher of, let us say, the Neo-Relaxation School. Full of vitality and energy, and readiness to work, he is taught the principles of relaxation, and made to see that this is the end which he must achieve. He practises this method diligently, and goes about his work avoiding so-called stiffness in all his movements, obsessed by the injunction that tiredness and muscular tension are the unforgivable sins. The result is that he never calls upon himself for the supreme physical effort, so obviously present in all forms of physical exertion. Inevitably, this flabby physical attitude has its effect on his mental processes, and he loses all instinct for power and dramatic intensity in his work—an instinct which can only come from the constant practice of extreme effort.

The remedy lies in the training of the power of discrimination between relaxation and contraction, or, in other words, the recognition of the equal importance of both these faculties of muscular action. The fault of the old schools was the teaching of too much contraction and stiffness : the great danger of the later schools is that of too much insistence on the opposite extremes.

Examining the question in detail, it will be found that the need for conscious contraction is the greatest with those muscles which take the recoil from the point of contact. These are chiefly the muscles in the arm itself, and more particularly those from the forearm downwards. The use of the shoulder muscles is mainly devoted to carrying the weight of the arm, partly by propulsion or passive relaxation. Observation of the physical conditions at the "point of contact"[1] will show that the greater part of the resistance at that point is taken up by the forearm and fingers. The use of the power and weight of the whole arm from the shoulder is effective in big chord-playing, and in legato-playing : but in all the swifter actions and re-actions, such as wrist-staccato, forearm-staccato, and firm attack (*e.g.* beginnings of crisp phrases, such as Schubert's Moment Musical in F minor, Beethoven's Sonata, Op. 31, No. 3, and indeed in countless similar examples), the forearm not only takes up the recoil, but also approaches its objective in a condition of fixation. This latter point is a very important one. When a sharp, firm attack is needed, the effect is greater, for instance, if the lever be one rigid entity, as is the case when the hand and forearm are braced together, than if the lever have a "break" in it, as when the wrist is held loosely.[1] In the latter case there is always the danger that the hand be used as a whip, as it were, and the resultant tone be uncontrolled and harsh. The control of the tone in such attack naturally comes from the muscles controlling the lever, in this case those of the upper-arm.

---

[1] See Chapter V.

A useful analogy is here suggested:

When we wish to touch anything gently—a delicate, sensitive surface for instance—we hold the forearm and hand in a state of contraction, fearful lest a loose wrist should drop uncontrolled and so injure the thing touched. This connotes stern control, and is obviously applicable to similar movements at the keyboard.

It is this power of controlled fixation and contraction which gives authority and definiteness to a performer's interpretation, since it must carry with it the exercise of sustained will-power, and it is this power which the great players constantly use, connoting, as it does, masterful vitality and *verve.*

Again, in swift octave and chord movements, while the original impetus of a series of movements may be conveyed by a whole-arm movement, the recoil at the point of contact is very often taken by the forearm, and continued into the recoils and also inceptions of the subsidiary movements arising out of that whole-arm impetus. This will be seen in the investigation of the practice of vibrato.[2] In all these instances the arms and hands are frequently in a constant state of fixation and contraction.

There need be no controversy on this question of contraction and tension. Where the highest effort is called for, there also must tension and grip be present: "making a supreme effort" is almost a cliché, and no great result can ever be secured without it. Even the most rabid relaxationist needs it for the Schumann "Toccata": and no artist can, without it, adequately rise to the thrill of the Finale of the Études Symphoniques or the Scherzo in B flat minor. To play any of these pieces in a state of so-called relaxation may be satisfying to the player's physical comfort, but it is anything but exciting to his audience.

---

[1] See Balanced Fixation, p. 57.

[2] See Chapter XI.

The solution of the problem before the student is not difficult if he examines the conditions critically. The power of relaxation is, after all, the result of muscular control, and it is also the corollary of muscular contraction : neither of these can be said to be under control without the other. Many of the advocates of relaxation are apt to forget that they began with the older methods of training : and much of what they imagine to be relaxation is not relaxation at all, but the reflex action that automatically comes from long practice ; and to teach relaxation to those who have had no muscular training is merely beginning at the other, and, it must be said, the wrong end. The study of the new methods has only shown them that this reflex action, and not the vicious muscular stiffness of the old schools, is the goal to aim at : and it has also taught them that this goal is reached by the practice of muscular discrimination, and inhibition of unnecessary muscular movements. Furthermore, it must not be forgotten that the *act of relaxation is itself an exertion* of the muscles concerned, limited though they may be by the lack of tension, and that therefore muscular growth ensues from the very thing which apparently inhibits it.

The lesson of all this is that the conquest of any technical difficulty should be approached from the purely gymnastic standpoint : all exercises should be practised with the maximum of muscular movement, *e.g.* in all preliminary work fingers should be raised and lowered with vigour, commensurate with the proper inhibition of all extraneous muscular and nervous interferences, the faculty for which is the more quickly acquired if a knowledge of the physiological conditions is present : then, as the muscular power develops and the margin of strength becomes wider, the attention can be concentrated on the minimizing of movement, and the isolation of the actual point of contact, so that the full contraction should take place only at that point, and the approach and departure therefrom be in relaxation. This process is that of going from the physical to the nervous ; all swift physical action is the result of nervous speed, and this speed is as necessary to relaxation as to contraction, and can only be developed by the practice of both.

It will by this time be understood that all this is in no sense a condemnation of relaxation—rather is it the corroboration of it in its right meaning of resilience: it is only necessary for the student to view the matter in the right perspective if he would attain definiteness and authority in his own playing.

Finally, this power of balance between contraction and relaxation and the realization of the value of fixation is the real criterion of the authority and definiteness to which attention has been called here. One has only to hear the playing of quite simple pieces by great artists, *e.g.* Rachmaninoff's performance of Scarlatti's Pastorale, to be convinced of this fact. The firm beginnings and endings of phrases, the sharp edges, the certainty and clearness of exposition, can only be the result of rigid control—masterfulness of body as well as of mind. How much more, then, is such power displayed in playing, for instance, that dynamic, dramatic opening of the Finale of the Appassionata Sonata, a challenging defiance which the dull soulless "arm-release" can never hope to achieve.

CHAPTER IX

THE ROTATION THEORY

The use of rotating movements of the hands and arms has called forth almost more controversy than any of the other ideas which modern thought has brought to light. The confusion of thought about this, as about other technical matters, has been due to the lack of accurate physiological observation and knowledge, and the absence of the application of the laws of mechanics to the problem. Even the advocates of the weight school have stumbled in the matter, and this is the more surprising since they maintain that the use of rotation facilitates the application of weight in given circumstances. Their theory is correct, but incomplete, and in many ways their application of it is wrong, physiologically and mechanically.

The rotatory movements of the arm and its parts are controlled by combinations of muscles in such a way as to make it difficult to divide them into separate compartments: nor is it of vital importance to do so from the muscular point of view except in the case of forearm rotation, since most of the movements deal with the rotation of the wrist and elbow-joints, both of which are really controlled by the shoulder.

There are two main movements, however, which must occupy most of our attention. They are:

1. The rotation of the forearm on its own axis, actuated by the supinating and pronating muscles in the forearm as well as by the biceps (in the upper-arm).[1]

---

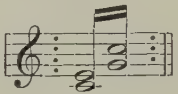
[1] See diagram, Chapter III, and note on biceps muscles, p. 39.

2. The rotation of the elbow-joint (and in some cases of the wrist-joint) actuated by the muscles in the shoulder.

It is the lack of understanding of, and confusion between, these two different actions, which is one of the causes of much of the controversy on this question.

The first—forearm rotation—can only be used for:

1. Broken octaves and kindred passages.
2. Tremolo passages such as:



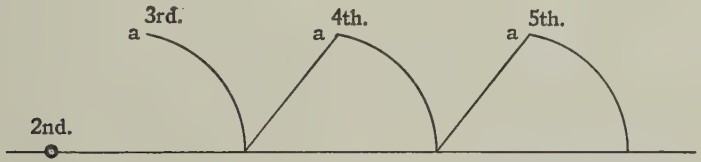
and shakes which are fingered 1 3, 2 4 (rarely), and 3 5.

All these passages call for the natural rotatory movement of the forearm.

It will be useful, before proceeding to examine the nature and use of the second of these two movements (elbow-rotation) given above, to clear up the misconceptions concerning, and the improper applications of, forearm rotation.

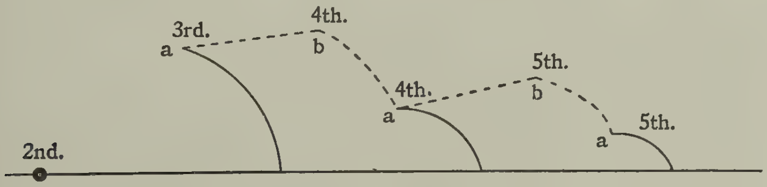
To use the rotatory movement of the forearm to play arpeggios, or even extended passages such as Dominant 7ths, etc., is a mistake, and subversive of good technique. Some teachers even go so far as to teach its use for five-finger exercises. Anything more unscientific, and indeed, more mistaken than this, it is difficult to imagine. The reason generally given is that this rotatory movement relieves the strain of undue stretching of the fingers. This reason is insufficient, especially since the strain can just as easily, and certainly more scientifically, be relieved by a purely lateral and horizontal movement of the arm. Furthermore, it has already been shown (in Chapter IV) that a lever requires a fulcrum: and a fulcrum, to be fully efficient, should be always in a direct line with the lever. This fulcrum is supplied by the flexing muscles of the forearm acting with direct, not rotatory, movement at the point of contact, against the fulcra, either at the knuckle or wrist, or both. If, then, the rotatory forearm movement be used, this fulcrum is not in a direct line, as the leverage starts from an oblique position. The fingers may possibly act against the wrist as a fulcrum, but only by a stiff and awkward lateral action.

The following illustrations will make these points clear. In the examples given, it should be borne in mind that the hand is rotating on the forearm, making the fingers descend obliquely and not vertically.



In this diagram, the starting point is the position in which the 2nd finger has already struck its key. The 3rd finger is poised at (*a*) ready to strike, and is made to descend obliquely. At the end of the 3rd finger's stroke, the 4th finger goes through the same motion, as also does the 5th finger in its turn. The theory is that the weight is *equally* applied to each finger in turn. But actual application of the theory reveals several defects.

1. In the above diagram, each finger appears to start from the same vertical distance (*a*) above the keyboard. A study of the following diagram will show what really happens:



Owing to the structure of the hand, each finger has to adjust itself to the position of its neighbours. When the 3rd finger is at (*a*) the 4th is approximately at (*b*): the full descent of the 3rd finger brings the 4th finger down to its own (*a*) position, which is lower than the 3rd (*a*) position. Any one of these positions could be adjusted by previously raising each finger higher as required, but this is contrary to the theory of the advocates of the movement, who claim that it eliminates unnecessary stretching.

2. If the rigid-finger method be adopted (*i.e.* if the above preliminary raising be disallowed), the only finger that can attack the key *directly* is the 3rd finger, since by the rotation of the forearm, the other fingers are bound to touch the key more or less with their sides. The motion is oblique, and the leverage therefore has no direct fulcrum.

3. Owing to the different points of descent in (1) and the different and oblique angles of attack in (2), the quality of tone is anything but uniform, and the weakness of the 4th and 5th fingers is, if anything, accentuated.

Again, it is claimed that the fingers are enabled by rotatory movement to be transmitters of the weight of the arm, the weight thus being applied equally to all the fingers. Again, in theory this is feasible, but in practice the different lengths of the fingers, and the different angles at which the fingers strike the key, contradict this theory. Further, it is not good technique to use the fingers as props, just as it is not good walking to use the legs as such, keeping the knees and ankles inactive.

It has already been demonstrated that in the true scientific act of touch the fingers must play their part of full movement, just as the ankles and toes do in walking, and *must* be raised (in whatever varying degree) before striking, unless they are to become mere stiff " jabsters " at the keys. Experiment with this finger-raising action combined with the rotatory movement of the hand will show that this is exceeding difficult, because the raising of the fingers is in the vertical plane, whereas the rotatory movement is in an oblique plane: and the two are unnecessarily difficult to combine.[1]

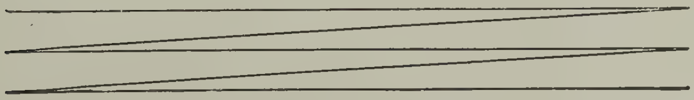
Having thus investigated these misconceptions, the way is clear to the demonstration of the true nature of the real rotatory movement—not that of the forearm, but of the *elbow*. It is this which forms so great an asset in technique, and certainly solves the question of the difficulties which we have under investigation. They are, as already enumerated, the relief of the strain of stretching of the fingers, and the conquest of the obstacles presented by the varying lengths of the fingers. Obviously the solution of both these difficulties is to move the arm to the position most advantageous, and least exacting of strain, to the fingers. A straight lever is better than an oblique one: the finger can function with more freedom and power if the arm behind it is in a direct line with it.

---

[1] It is admitted that in brilliant passages which do not call for any subtleties of tone, but for swift execution only, the finger raising need not be so pronounced, and that the rotatory movement may be useful: but even then it will be found by experiment that an undulatory movement (see Chapter VI; also Figs. 13, 14, 15)—in the vertical plane—gives more efficient and supple results. In this method elbow-rotation plays the important part.

What is the best way of shifting the arm and its weight? Certainly not by the rolling of the forearm, since the centre of the weight thus remains practically in the same place, with little or no fulcrum, and, in the case of wide extensions, with some strain to the fingers, whatever the advocates of the method may say.

A partial answer to the question is: By shifting the whole arm laterally. The completion of the answer comes when we carry the matter a step further by using the wrist in an undulating way, as described in Chapter VI, and, in return movements, avoiding angularity by rotating the elbow. For example:—If, after shifting the forearm laterally in a given direction, we make the return shift in the same straight horizontal line, we get a movement marking a "check" at each end. This movement is suggested (though not, owing to dimensional difficulties, accurately described) by the following illustration:



which can, for the purpose, be descriptive of what happens: in reality, of course, the arm should be imagined as moving backwards and forwards on the same horizontal line. We can overcome this difficulty of "checking" by turning the above angles into curves, the straight line thus becoming an ellipse.[1]

This curve, being continuous, secures the continuous *unchecked* movement of the arm; the curve is described by the *elbow*, and it is made possible by an undulating wrist.

Here, then, is the answer to the question.

The relief of strain, and the application of the weight in any extended passage and in any direction, are obtained by the lateral shifting of the arm, operated by the rotatory movement of the *elbow* in the horizontal plane, any variation in the vertical plane being taken up by a flexible wrist.

In Chapter VI it was shown that the undulatory movement of the wrist formed part of the movement of the whole arm. The upward and downward fall was demonstrated to be the result of the "pushing" and "pulling" of the arm. In using this undulating movement in conjunction with the rotatory elbow-movement, it will be found that the wrist, instead of moving longitudinally in its undulations, itself describes a curve according to the "nature of the ground" of the passage which is being played: in other words, its path is not in straight lines but in curves (*e.g.* Ex. p. 72): in a continuous movement in the same direction up or down the keyboard, the wrist of course describes a series of curves the plane of which is at right angles to that of the elbow-curve. The wrist and elbow moving together thus have a gimbal-like effect, or better, they both act as universal joints which enable the whole arm to move freely in any given direction. The rotatory action of the wrist is what is so often mistaken for the rotatory movement of the forearm, whereas it is in reality both the cause and the effect of the rotatory movement of the elbow, which in turn is operated by the upper arm and shoulder.

---

[1] Breithaupt's graph of Chopin's Étude, Op. 25, No. 1, takes this form of an ellipse. (*School of Weight Technique*, Vol. II.)

It can therefore be laid down that:

1. The rotatory movement of the forearm is a definite muscular effort for the purpose of meeting definite technical difficulties which can be met in no other way.

2. The rotatory movement of the elbow and wrist are means employed to enable the fingers and other parts of the arm to function with the greatest possible suppleness, especially in extensions, and in the application of power to the weaker fingers, and to place them in the best possible position to secure that suppleness.

The conclusion to be drawn here is the same as that in Chapters V and VI, and is, in fact, the conclusion to which all proper scientific investigation of technical questions must ultimately arrive, that the pianoforte is played, even in its smallest details, with all the arm and its parts working actively in co-ordination: and the aim of all technical practice must be the attainment of the greatest possible freedom of movement, and the inhibition of any impeding factors, whether in the nature of set positions, or of spasmodic nervous or physical interferences.

CHAPTER X

THE FINGERS

The question of the fingers has been left till now, because their proper use depends on the realization of their dependence on movement of the rest of the arm.

The fault of the early systems of technique lay in the fact that they began with the fingers, and left the question of the use of the arm to the last, and even then almost left it to take care of itself.

On the other hand, the modern tendency to place so much importance on the use of arm-weight has led to the neglect of the fingers in their individual capacity, and their development has been, if not overlooked entirely, at least treated perfunctorily. This is undoubtedly the explanation of much of the sloppiness and downright untidiness of pupils of the modern schools. The new feeling of freedom and suppleness, caused by the shifting of the burden of physical strain on to the muscles of the arm that were better able and fitted to bear it, seemed to show that all those dull, mechanical exercises were to be things of the past. A royal road to technique was open, unbeset by the thorns and rough going of grinding exercises and incessant repetitions.

The road was open, it is true: but there were still many turnings. Some wise man has said: " There is no royal road except that of hard work." But even hard work can be unprofitable unless it is properly directed.

The right road in pianoforte playing is the practice of the use of *every part* of the physical organism of the hands and arms, and even of the body. The neglect of any one part of that organism is a wrong turning on that road.

In dealing with the development of finger technique, the same attention to muscular conditions must be paid as to the other parts of the arm. Observation of the general laws of contraction and relaxation will carry the student a long way : but a sound knowledge of the mechanism of the fingers is a necessary equipment for the highest achievement and permanency.

Much of what follows has already been given in Chapter III. Repetition is necessary in order better to discuss its practical application.

The large flexor and extensor muscles of the fingers are situated in the forearm. The abductor and adductor (those which move the fingers sideways) muscles are in the hand. The latter are called interossei muscles. There are also in the hand the muscles called lumbricales, which play an important part in flexing the fingers, combining with the muscles in the forearm ; the interossei combine also in extending the fingers.

If the hand be held with the fingers in a straight line with the back of the hand, and a flexing movement be made, the first muscles to come into play will be the lumbricales (situated at the base of the fingers). These muscles flex the first phalanges of the fingers.

As the flexing movement proceeds, the forearm flexors come into play, acting on the 2nd and 3rd phalanges, and continuing the flexing of the first phalanges inaugurated by the lumbricales. In the return movement of extension of the fingers, the forearm muscles act first, extending the 1st phalanges, the interossei following with the extension of the 2nd and 3rd phalanges.

From this it will be seen that the flexion and extension of the fingers are *started* from different points, the latter from the forearm, the former from the hand. Since the fingers articulate at the knuckle-joint (at the base of the 1st phalanges) this flexing and extending from different parts not only obviates friction, but is a most important guide to right finger action.

It will be useful to digress at this point, and recall the fact demonstrated in Chapter V that in the act of touch the real muscular strain on the flexors comes when the point of contact is reached, and all flexing muscles co-operate in acting as a "brace" against the downward pressure of the arm-weight. Experiment will show that the descent of the finger is begun by the lumbricales, and that the main function of the forearm flexors is that of taking the resistance at the point of contact. This again obviates undue strain and friction: and it is clear that the constant practice of the conscious *location* of these muscular operations is an invaluable adjunct to finger development and control of timing.

It follows from all this that finger action should be simple in its movement. The finger should articulate from the knuckle-joint: it should be raised in its entirety, retaining its natural curved state (*i.e.* with the 2nd and 3rd phalanges slightly flexed), the flexing muscles being inhibited from too pronounced action, and it should be drawn down again in the same shape, the extensors being gradually (indeed almost instantaneously) relaxed.

The old-fashioned action of raising the finger and "hooking" it, like the cocked trigger of a gun, is physiologically wrong. Reference to the muscular process described above shows that this "hooking" must be done by the forearm flexors which bring about the downward action of the finger: as the finger is being lifted and extended these flexors will naturally come into opposition with the extensors. Again, the flexing of the 2nd and 3rd phalanges compromises the shape of the fingers for the downward stroke, and they will have to be "unflexed" before they can come into their proper action, which is that of taking the strain of resistance at contact. The interossei are the *extensors* for this function of unflexing, but if they are already occupied, as is the case in assisting in flexing the 1st phalanges at the beginning of the downward stroke, they are being employed in two functions at once, with the certain result of friction and strain.

One more point needs to be emphasized here. It must always be realized that any blow of the finger must have its repercussion on the arm; in other words, the weight of the arm is, in a varying but constant degree, behind the finger. The mere contraction of the finger is not enough to depress the key with sufficient speed and weight to produce good tone, and the secret of producing good tone is dependent on the accurate timing of the entry of the arm-weight into the action.[1] The tone is produced by the meeting of the two forces of weight and inertia, and the *amount* of weight (and its speed) determines the *quantity* of the tone. The recoil of this weight falls on the muscles in the hand (the lumbricales and interossei) as well as in the arm. There is, therefore, a moment of rigidity in the hand, and the theory of keeping the fingers relaxed throughout falls to the ground. To meet the resistance with relaxed fingers is bound to be productive of flabbiness and poor tone.

The question of method of action of successive fingers now arises. It has already been outlined in Chapter V, and is further elaborated here.

The following anatomical details are important :

The forearm flexors which are attached to the three fingers 2, 3 and 4 are embodied in one comprehensive muscle : [2] the portion of the tendon for the index finger is, however, fairly distinct throughout, but the tendons are connected together as far as the palm of the hand. The flexor of the little finger is in the palm of the hand in what is known as the hypothenar region.

In the case of the forearm extensors, both the index finger and little finger have separate extensors.[3] It is owing to these separate muscles that each of these fingers can be extended or pointed while the others are flexed.[4]

These details are given in order to impress upon the student the fact that, owing to this physical construction of the finger muscles, the independence of the fingers depends not so much on isolation of muscular feeling as on isolation of the nerves which are attached to the large muscles, and connect individually with the fingers.

---

[1] This arm-weight can be manifested by using the knuckle-joint as a fulcrum against which the weight is supported by a finger that is rigid at the point of contact. The finger at the moment may even be said to partake either of the inertia of the keyboard or of the weight of the arm. See p. 50.

[2] See Fig. 7 (flexor profundus digitorum).

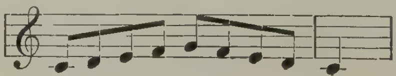
[3] See Fig. 5.

[4] In spite of this apparent complication, the flexors and extensors can in each case all be contracted in one action, in the one case by clenching the fist, and in the other by extending the fingers backwards. The exercises given in Chapter IV, p. 41, are given for this purpose

In dealing with successive finger action, the urgent question is that of raising the fingers. It is obvious that the finger must be raised before it can be lowered: otherwise it becomes merely a prop or crutch. The difficulty lies in performing this raising in such a way not to stiffen the hand.

To begin with, it is not a technical crime to raise several fingers at once, in the act of playing. For instance, if the 2nd finger has played, and the 3rd finger is poised in preparation to play, the 4th finger has a tendency to raise itself too. It would be foolish, and subversive of suppleness, to try to prevent such sympathetic movement (which is due to the pull of the cross-tendons). The conditions at the point of contact, however, viz. the downward stroke of the finger, accompanied by the thrust of the arm-weight and the muscular energy required to take the resistance, are necessary before any tone is produced; the 3rd finger (in this instance) is in readiness to carry out these conditions, and the 4th finger is not: the 4th will therefore fall harmlessly without sufficient energy to strike the key. It is true that this separation of muscular energy will require practice: but it will be *right* practice; it would be *wrong* practice to use up part of the energy needed for the 3rd finger, in *forcibly* preventing another finger from moving, and incidentally stiffening the hand in the process. Fingers, then, may be left to move *by associative tendon movement*; so long as no muscular energy is imparted, no harm ensues.

Each striking finger should be released (inhibited) as soon as it has done its work. To force it upwards in trigger fashion is useless and a cause of stiffness. When it is wanted again it can be raised in time. The point to be reiterated is that the fingers should be raised *as a preliminary* to striking, not as an adjunct to it. It will come about in course of time, and as a result of practice, that groups of fingers can be held in the raised position, each ready to strike in its turn. For instance, in playing the five-finger exercise:



all the fingers may be raised to begin with. When the thumb has struck its key, it may begin to rise, followed by the others in turn, until at the 5th finger stroke the thumb has reached its highest *comfortable* elevation, and the remaining fingers have risen in their turn, at graduating heights, the thumb being the highest, the 4th lowest. The thumb does not spring up immediately, as taught in the old-fashioned methods : its rise is gradual as a *preliminary* to being used again, as also is the case with the other fingers : the 4th finger having to act again almost immediately in the downward passage is raised as little as possible.

The finger-raising here described is the one best suited to the passage illustrated. The raising must be considered as a preliminary to the lowering needed for the downward passage, *i.e.* the return from G to C. If the passage had been upward only, terminating at G, each finger would have been merely left to take care of itself, inhibited from interfering with the others, and not deliberately raised at all.

This raising is best *practised* by the use of the method given in Chapter V,[1] with the aid of the supple wrist. The following is another variation, useful for practising single finger action, without the cramping conditions which were always present in the old "still-hand" exercises of the Aloys Schmidt variety.[2]

After striking with the second finger, let it relax to a point that is just sufficient to hold the note down (always doing this holding down with the weight of the arm, in however small a degree : the finger is then a pivot on which the weight may swing in readiness for the next finger). Up to this point the 3rd finger should remain passive. Now raise it, keeping the 2nd finger elastic and ready to straighten itself (as demonstrated in the example in Chapter V) in order to give the 3rd finger plenty of room to swing, and even used as an elastic propellant, just as the rear leg in the act of walking. Then let the 3rd finger descend: as it reaches the point of contact swing the weight from the 2nd finger to the 3rd so that the power of the weight arrives with it at the point of contact, and it takes the resistance accordingly.

---

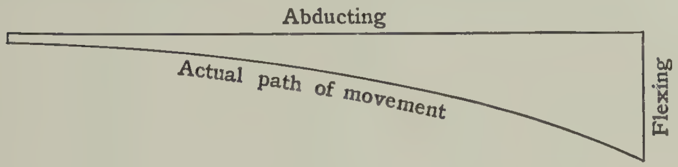
[1] p. 62, Example 1.

[2] It must be understood that exercises of this kind are designed to cultivate right action, and not muscular strength : the practice of gymnastic exercises for the fingers will be sufficient for the latter.

The exercise should be practised with each of the fingers, by using any one finger as the pivot on which to swing the weight, and exercising the fingers on either side of it in the same way. This will be found an excellent substitute for the old "still-hand" exercise where *all* the fingers were held down. It is admitted that there must be an exercise of this kind for developing correct finger-action; all that is needed is a pivot on which to swing the weight of the arm; the use of different fingers will serve the purpose and at the same time maintain suppleness in the hand.

Stretching of Fingers and Extensions.

The question of stretch is always a problem. A great deal of the difficulty can be avoided by correct movements of the arm: this matter has already been dealt with in the chapter on Rotation. It was there shown that the elbow was shifted in order to get the weight of the arm behind each finger as it was used. It is essential to avoid as much as possible playing with the fingers at full lateral stretch. It is far better to swing the hand laterally on the finger already holding the note until the next finger to be used is as near as possible in a position to play *with the arm directly behind it.* Further, it will have been seen from what has just been said about the interaction of the muscles of the hand that the interossei and lumbricales act both in flexing and abducting (as well as in extending and adducting) the fingers. Complete isolation, however, of these two functions of the muscles is difficult, and indeed not absolutely necessary, but it is important that the combination should be used with the least possible strain. For instance, in taking a stretch from the 3rd to the 4th fingers the abducting movements should be made first and the flexing movement deferred until the actual moment of descent. The involuntary tendency to flex too soon induces complication and consequent friction. It would appear that the path of the 4th finger (in this instance) would be rectangular :



and this indeed should be the mental process at first : but in practice the movement, if properly executed in combination with lateral arm-movement, becomes a curve. We thus have the true rotatory movements which connote real suppleness (as defined in Chapter IX), in which all the curves are combined, the fingers moving in the above curve, the wrist rotating in a vertical plane, and the elbow in a horizontal one, the *whole* arm thus coming into action. Once more we arrive at the same point to which all investigations of the theory of technique converge, viz. the free use of the whole arm with all its parts acting in co-ordination. The application of the principle to the practice of extensions will solve a great many of the difficulties which arise. At the same time it must not be forgotten that the question of physical endowment must be treated sensibly. There are some people, as Professor Auer[1] says, whose physical disabilities are so pronounced as to make it necessary to advise them to give up all idea of ever being able to play really well. These are, however, exceptional cases, and it is possible even then to improve matters by massage and gymnastics. Very often disability of stretch is due to tough palmar skin : in this case, much may be done by continuous kneading and massage as well as by stretching exercises away from the keyboard : a deep web to the fingers can also be treated in the same way. Again, in the case of stiff, inelastic ligaments, careful stretching will bring about improvement, if knowledge and control of the right muscles are brought to bear to avoid overstrain. The danger of the use of implements for stretching, in inexperienced hands, has already been mentioned ; if they are used the student should take particular care to avoid damage to his hands : if such drastic methods are adopted, it is vital always to keep the muscles in complete relaxation during their use.

---

[1] *Violin-Playing as I Teach It.*

The Thumb.

The right use of the thumb is, as with the fingers, a matter of knowledge of its physical structure, and the difference of its action from that of the fingers. The difference lies in the *direction* of the muscular action. In *flexing* and *extending*, the thumb proceeds in a *lateral* direction (across the palm of the hand) and in a vertical direction in abducting and adducting. When, therefore, the fingers are flexed, the thumb has a natural inclination to flex also : this may be useful in the action of gripping, but is not at all useful for playing the piano. The flexing action occurs when performing the operation which is called " putting the thumb under." Over-contraction of the flexing muscles of the thumb causes interference with the lumbricales and interossei muscles of the fingers, and results in unnecessary stiffening of the hand in the palmar region.

The action of the thumb in playing the piano is, in its simplest form, that of abducting and adducting, and the abductors take the strain of resistance at the point of contact. The thumb thus operates in the opposite way (muscularly) to that of the fingers. It should move in a vertical direction, and articulate (*i.e.* move from the joint) at the point where the thumb joins the wrist.[1] To endeavour to articulate the thumb from its knuckle-joint is not only extremely difficult, but a waste of time, since it is acting contrary to the natural structure of the thumb.

The only time when the phalangeal knuckle-joint of the thumb articulates is when the thumb is flexed, and then it is only part of a greater movement, just as the flexing of the 2nd and 3rd phalanges of the fingers is part of the whole flexing movement of the fingers.

---

[1] The section of the thumb from this point to the end of the metacarpal bone (see diagram in Chapter III) should be considered for piano-playing purposes as corresponding to the first phalanges of the fingers.

PLATE VII.

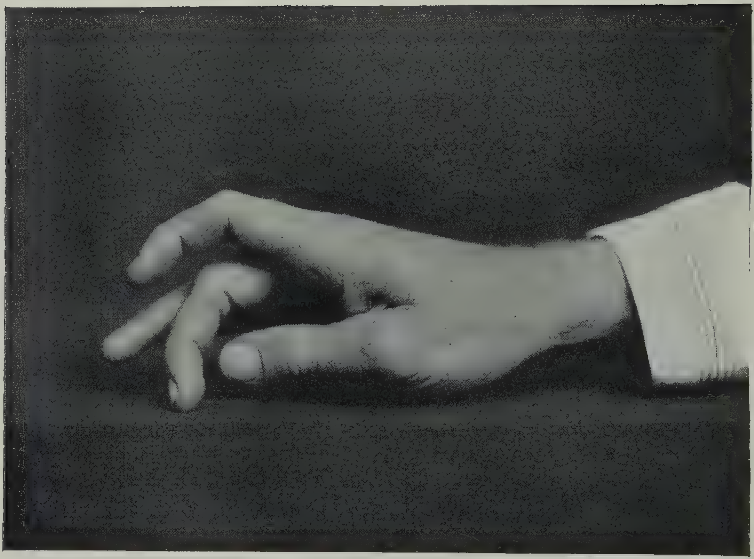


Fig. 16.

In every movement of the thumb, whether direct or oblique (as in the thumb-under position), *this vertical ab- and adducting movement should be aimed at.*

In putting the thumb under (or rather, across), the hand should be slightly turned over (supinated : the back of the hand turned towards the direction whither the thumb is moving) in order to leave plenty of room to perform this abducting movement.[1] This turning over movement has two results : it obviates the excessive contraction of the flexing muscles of the thumb, and it leaves the index finger in a better position to function than it would be if the hand were turned laterally (by the adduction of the wrist) with the thumb underneath it ; in this latter position the index finger would be pointing in the direction opposite to that required, and it would have to waste time recovering from that position. Further, in this awkward position of the thumb (under the hand) the thumb would be forced to play its key almost with the thumbnail—a most unnatural position.[2]

The proper action of putting the thumb under should *appear* almost like putting it " over " rather than " under." The thumb should be *swung* from its position, where it has lain inhibited after striking, to its new position, by the combined supinating action of the hand and a lateral movement of the forearm, its own flexing muscles taking part, of course, in the movement. The habit of gradually moving the thumb under each finger in turn (by flexing it), until its new position is reached, is not advisable. At its best it is only a less pernicious form of the old forced thumb-under movement, and, except in slow passage-work, is of little or no use. Every great pianist playing a swift arpeggio, for instance, swings his thumb into place by the movement described above.[3] He may have been taught the old " thumb-under " movement, and, in the absence of knowledge of physical conditions (such knowledge would have opened to him the possibilities of gymnastic exercise to secure the end in view) have developed the flexing muscles thereby: but his natural physical genius prevents him from carrying out the movement when the necessity for speed arises. In this, as in others of a similar controversial nature, the solution can almost always be found from a clear understanding of physiological conditions, that the flexors of the thumb do play their part in the "thumb-under" movement: the mistake to avoid is that of using the flexors only, without adjusting the arm to meet the new position: and the adjustment of the arm in its turn must be such that it will allow the thumb *to function in, as near as possible, the same way as in its ordinary action when lying alongside the fingers, which is, by abducting and adducting.* If this is done, all other difficulties, such as smooth progression in the "thumb-under" action, and getting the index finger into a position to act again without having to recover from an awkward position, will solve themselves. The old "thumb-under" action was killed by Brahms, who advocated (not verbally, but illustratively in his own "51 Studies" and in various passages in his works which he fingered himself) the fingering of arpeggios in "blocks of four notes." This system necessitated the use of the 5th finger, and consequently the complete lateral shifting (or swinging-over) of the hand to the new position. To play these passages by putting the thumb under, or the 5th finger over, needs only to be attempted to prove its absurdity.[1]

---

[1] See Fig. 16. The exact opposite to this, the turning of the back of the hand towards, instead of away from, the thumb used to be taught in the old-fashioned schools.

[2] Such a position actually occurs in Cramer's study, in G minor, for putting the thumb under. It has been altered, however, in Bülow's edition.

[3] See also Chapter XI, p. 121.

Safonoff, in his "new Formula," recognized the difficulty of combating the interference of the thumb with the fingers, and devised ingenious exercises to cope with it. The difficulty of independence can always be solved by inhibiting the thumb when it is not operating just as each finger can be inhibited: and the whole question of thumb and finger action depends on allowing the arm to co-ordinate freely in adjusting the hand to the position most convenient for the exercise of their functions.

---

[1] See Appendix II. It is only another instance of approaching the subject from the wrong point of view. Real smoothness does not inexorably mean overlapping: evenness of tone is quite as important—we have only to experiment with legato octave-playing to prove that. The rest lies in reducing the gap between notes to the minimum that circumstances will allow. Smoothness of movement has to be considered; and it is patent to most people that if the smooth lateral movement of the arm on its way to a new position be broken by the cross-movement (almost a jerk) of the old-fashioned "thumb-under" movement, with the elbow pointing too far outwards, it is bound to have its effect of clumsiness on the keyboard. In quick arpeggio playing by a good player *swinging* his thumb across, the gap is so small as to defy detection.

Finally, it must here be insisted upon that the continuous repetition by means of exercises devised for the purpose of technical difficulties is the only way of developing and expanding the "mental vision," both in its printed aspect and in its topographical aspect on the keyboard: every virtuoso knows that such incessant rehearsal clears the vision if it is carried out from the right perspective: but too often the repetition is looked upon as a mere finger exercise—and therefore becomes mechanical—instead of a mental one. There can be no doubt in the logical mind that this point of view must be applied also to finger-exercises which are gymnastic in their purpose: mere blind repetition leads only to unreliable achievement; and permanent results can only ensue when development is controlled by underlying scientific knowledge and mental concentration on all physical action.

CHAPTER XI

THE HIGHER DEVELOPMENT OF TECHNIQUE. VIBRATO

HITHERTO we have dealt with the question of what might be called the orthopaedic side of technique, the *right movement* of the various sections of the arm and hand.

The practice and attainment of right movement opens up a sufficiently large field to the ordinary aspirant : by its means he can master most of the great masterpieces of pianoforte music as far as efficiency and finish of playing are concerned. It is to this point that most good students arrive, sooner or later, and in a more or less efficient way, according to the manner of their training. It is, nevertheless, a long way from the point of highest attainment ; it is a stage, on the whole, plainly marked, beyond which it is very difficult to pass ; indeed only those do so who possess supreme vitality and determined concentration, and the resolute ambition to become more than merely first-class players. Development from this stage is largely psychological, and therefore, in the still indefinite state of this new science of psychology, it is difficult to lay down any rules or dogmas. But there is still a physiological field to explore, not unknown to great teachers, but not yet sufficiently opened up to scientific research.

Breithaupt is the only one who refers to it in his book, *Die Naturliche Klaviertechnik*, but only in connection with swift octave-playing. He definitely speaks of it as " vibrato." There are passages in Liszt's works, and written testimony also by his contemporaries, which show that he knew and practised this habit of "vibrato." Examples of it can be seen in his "Rigoletto Fantasia," the "Sonata après une lecture de Dante," "Wilde Jagd" and other studies. Rosenthal also, in his "Technical Studies" (octave section) writes the studies in such a form that they can only be played by means of a vibrato movement.

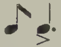
It will be as well, before investigating details, to attempt a definition, admittedly inadequate, of this form of technique. The word "vibrato" has generally been used to describe it: one authority uses the word "tremolo": it is most likely that the former word will survive, as being most applicable both in its descriptive and onomatopeic character.

"Vibrato," then, may be defined as:

> A state of fixation (or tension) of whole groups of muscles, which contains in itself, and controls, a corresponding group of actions, and is initiated by one embracing impulse of nerve power.

A corollary may be added:

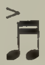
> The ultimate result of continued practice of this, is a lessened strain in the tension, the physical actions becoming reflex, controlled as before by the inceptive nervous impulse: and these nervous impulses can be trained to control groups of such reflex actions.

The simplest form of illustration extraneous to the piano is that of knocking on a door or table with the knuckles. Taking an ordinary double knock as an example, and illustrating it in musical rhythmic terms, it will be found to be:  Although the first is less emphatic than the second, both proceed from the same muscular and nervous impulse. Analysing it physiologically, the knocking effort is not made muscularly by the forearm muscles (operating the wrist): the hand is held loosely, and shaken by the more or less violent *contraction* of the upper-arm muscles.[1] The first knock is an advance knock, as it were, lighter than, and a preparation for, the more vigorous second one. It is as if the first were a kind of muscular "trial-shot," which in reality it is: both shots are made by the wrist in movement, propelled by the upper-arm contraction, the difference between the two being that in the first shot the whole arm does not take any strain of repercussion, whereas in the second it does take such strain.[1]

---

[1] This contraction will be felt by grasping the upper arm with the other hand during this action.

The reverse example now needs attention. It is illustrated thus:



Here the lighter impulse comes *after* the full repercussion: it is the result (or aftermath) of the momentum imparted to the arm by the first vigorous stroke.

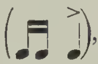
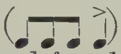
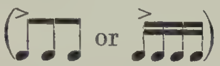
It is necessary to be clear on the point of difference of impetus in these two examples. The 2nd has just been explained: the impetus of the first knock creates the momentum for the second. But the question arises concerning the 1st example: Whence comes the impetus for the lighter impulse which precedes the accented one? The answer (in physiological terms) is, that both are conveyed by the contraction of the muscles (in the upper-arm: those which extend the forearm, thrusting it forward); the wrist being held loose is set in vibration, and strikes the table with that momentum: but the resistance at the point of contact is taken by the wrist (forearm) muscles, and not by the upper-arm muscles. The latter go on with their original impulse and take the resistance on the accented note: the entire action consisting of the main upper-arm muscular action, with the wrist action operating within it and controlled by it. From this it will be seen that in reality the impetus is the same in both cases, the culmination being different. The complete explanation is that in both cases the triceps throws the arm forward; in the second example the movement is carried right through to the point of contact and repercussion, and the brachialis muscle is relaxed to allow this to be done: and in the

---

[1] It may be said that in the first knock the "anchorage" is from the wrist (or perhaps the forearm) and in the second it spreads over the whole arm. Or again, the wrist acts as a fulcrum in one, and the elbow in the other.

This theory of distribution of "anchorages" should be borne in mind throughout all the examples in this chapter.

1st example, the movement of the arm is checked on the first stroke by the restraining action of the brachialis muscle, the repercussion on the whole arm (*i.e.* the entry of the elbow fulcrum) being deferred to the second stroke.

The same principle applies to the use of triple , or quadruple  knocks, the elbow fulcrum resistance being merely deferred if Example 1 is used. If Example 2 is used, 

the number of vibrations is obviously governed by the force imparted by the initiating impulses. In short bursts it will be found that Example 1 is the one most employed. In prolonged vibrations with continuously alternating impulses, the two are merged : this side of the question, and that of other factors which enter into the operation, will be developed when their application to the keyboard is discussed.

Two more points must be noted before leaving this preliminary investigation :

1. In experimenting with Example 1, the student will have observed that in the process of double, triple, or quadruple knocking, the whole of the upper arm is in a state of tension. This is explained by the fact that the triceps muscle is exercising its power of thrust, and the brachialis is at the same time exercising its power of restraint in deferring the culminating accent. At first sight this would seem to involve unnecessary strain, but it is almost inevitable in spasmodic bursts of this kind ; in continuous vibration, however, it will be found that this strain can be considerably modified by shorter action, and the consideration of the second detail will throw further light on the problem.[1]

2. It was said that in Example 2 the number of vibrations was limited by the power of the original impulse. This only applies in cases where the wrist is held in a state of passivity, and *shaken* by the impetus. It is, however, possible, and easy, to use the

---

[1] Furthermore, the double contraction (of brachialis and triceps) is the very condition which (in combination with the assistance given by the attachments of the deep fascia. See p. 26) sets up Vibrato.

muscles of the forearm to operate the wrist lightly, and so increase the number of vibrations: and these muscles derive much of their energy from the impetus imparted to them by the thrust of the triceps impetus.[1] The duration of the vibrations then depends on the length of time during which they can continue to operate without fatigue; when the original impetus has spent itself, these forearm muscles must perforce function by their own power and so sooner reach the point of strain, unless the impetus is renewed. This matter of renewal will be dealt with in considering prolonged vibration. It is obvious that if the wrist muscles assist in this way, they must have their own point of resistance: but this resistance must be well within the limit of their strength: too much pressure of resistance would communicate itself to the upper arm muscles, and the vibrations of the wrist (being a subsidiary fulcrum) would cease if the greater fulcrum of whole arm came into the resistance before its predetermined time.

Applying the principle to the keyboard, using octave-playing for the purpose, we are met by a factor which is not present in the "knocking" illustration. There we had a hard surface to knock against: here we have a moving key, actuated on a balance, and possessing a resilience which can be made use of in co-ordination with the resilience of the arm or hand. At first sight this would appear to make it easier to set up vibration, and to prolong the number under each impulse. This is true, but it must be realised that muscular impulse is required in order to upset the balance of the key, and consequently the necessity arises for active rather than passive action by the vibrating wrist. In brilliant octave passage-playing, where no particular control of touch is required, this may not be so necessary, since the wrist can be kept in a state of passivity, being *shaken* towards the key by the upper-arm.[2] It was this method of technique that

---

[1] Here again is an instance of distribution of anchorage or fulcrum, the wrist fulcrum operating repeatedly, the elbow at longer, but regular intervals.

[2] This is an instance where the key can be "hit at." See p. 53. Even so, although this passive action of the wrist may produce great speed, it entails a greater strain on the upper-arm muscles than would be the case if the wrist muscles assisted and co-ordinated with them.

Liszt used when he was said to " shake the octaves out of his sleeve." But in static repetition, such as in that of the Liszt-Schubert " Erl-King," it is absolutely necessary to use the balance of the key, and for this purpose muscular action of the vibrating wrist is inevitable.

This static repetition is the best illustration to use in the discussion of prolonged vibration, and we must now take up all these preliminary details and show how they can be co-ordinated.

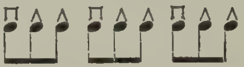
A little thought will show that in a prolonged vibration the place of the accented impulse (whether at the beginning or the end, as shown in the two examples above) is immaterial. The impulses are constant, and the only question is that of what happens between them. It can be said, however, that in practice, Example 2 (where the vibrations are the *result* of the impetus) is the one that is most general. The wrist muscles assist in continuing the vibrations, while the upper-arm is preparing itself for the next impetus. The process will bear detailed physiological examination.

The initial impetus is given by the triceps and shoulder muscles, the latter swinging the whole arm, the former the forearm : this sets the vibrations going, the forearm (wrist) muscles assisting with their own muscular power (which is intensified by the impetus) and also making use of the vibrations of the balanced key : while they are doing this the brachialis muscle helps to steady them and prevents the forearm from descending far enough to let the elbow come into fulcrum resistance. In the meantime the shoulder muscle (the deltoid) is lifting the whole arm in preparation for a new downward and forward thrust, which is to constitute the new impetus. During all this the wrist is vibrating : at each fresh impetus the strain is momentarily taken from the wrist, and these vibrations are then given a new lease of life as it were, and the whole operation is repeated and carried on to the limit of physical endurance of the big muscles in the arm and shoulder. This endurance will increase as the strength of the muscles increases.

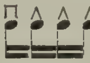
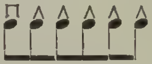
It will be realized that throughout this operation the wrist must *undulate* and the elbow also must be free, in order to allow for the " play " of the upward and downward motion of the arm.

This undulating movement of the wrist carries the question of economy of exertion a step further, and will repay study.

In the definition of the process just given, only one position of the wrist, the low one, was visualized for the impetus stroke: during vibration the wrist-joint moves upwards (into the arched position) so as to be in a position to be lowered again by the impetus. An illustration will make this clear. The sign ⊓ represents the low position of the wrist, and ∧ the high one (or a series of rising ones). In the example:

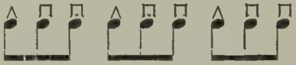


the impetus is made on the ⊓ stroke, and the ∧ ∧ represent the gradual rising of the wrist-joint (still in vibration). With practice this can be developed into

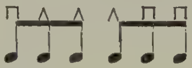
, or even, 

but prolonged groups are unnecessary if the ability to recover to the preparatory position without exertion can be acquired.

In the example:



the positions are reversed, the thrust forward of the arm being made towards the high position of the wrist, but this distribution of energy is awkward, and only useful in alternative groups such as:

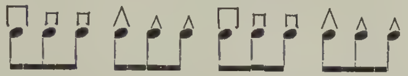


Even so, it is seldom or never used.

During the vibrations the changing of the wrist from one level to another must be gradual, and, when the wrist muscles are being used to assist vibration, as they should be in passages of this kind (this method takes the strain away from the shoulder and upper-arm, too much "shaking" being very tiring), *their points of contact and repercussion will naturally occur* at different levels. The error of exaggerated movement should be guarded against, particularly in the movement upward to the high-wrist position.

This latter movement should culminate at the horizontal, or very little above it, in order to avoid "locking," which causes impediment to the wrist rebound, and often tends to nullify the movement altogether by lifting the hand right away from the keyboard.

The practice of the above examples will ultimately lead to the general use of the following combination :[1]



Here it will be seen that the vibration of the wrist is carried in the same direction as the original impetus. Care must be taken to avoid the danger of exaggeration of the impetus stroke. If the forearm is lowered to the limit, the wrist is unable to come back (in its extensor function) : if it is raised too high, it is equally unable to flex properly. Hence it follows that the impetus stroke either in low-fall or high-fall must always be short of the limit, in order to allow of the free vibration of the wrist within the major impetus. In practice it will be found that each impetus stroke ⊓ or ∧ brings the wrist very little below or above the horizontal, the vibrations being made practically at the same level. In preliminary study, of course, the movement should be more pronounced in order to develop muscular control : it must gradually be modified as skill increases.

This demonstration will have been seen to be a still further explanation of Kullak's instruction to keep the wrist moving during prolonged octave-playing. The undulations serve not only to promote suppleness, but also to enable the different muscular functions to operate independently.

It has been necessary to examine the process at some length in order to throw light on details, and to find the physiological basis. Expressed in simple terms the whole operation may be stated to consist of a series of impulses imparting a vibrating rebound to the wrist: in short bursts, the vibration is almost involuntary, depending on the force of the impetus: in prolonged playing, the vibration is assisted by the wrist muscles, and is then voluntary.

---

[1] Analysis of this movement also shows that the first of the three impulses uses the elbow as fulcrum, and, once it has been "committed" it remains still (or proceeds to its next position, from high to low, or vice versa) while the wrist continues to vibrate in the next two vibrations on its own anchorage at the carpus, or wrist-joint.

The ideal condition should be that the vibrations should be contained in the impetus; in other words, the impetus contains within itself a group of actions, which may be termed reflex, which are released by the act of impetus. If the wrist assists in the vibrations, it can be said that the reflex actions are *in control*, paradoxical as that may seem.[1]

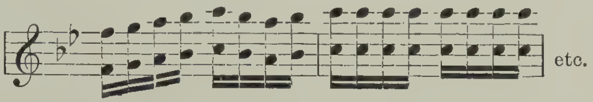
For purposes of preliminary practice, before attacking the study of repetitive octave passages, it will be better to use chords of three or four notes within the span of the hand. By using three or four fingers, a greater support is given to the hand, and, incidentally, the greater muscular power which has to be exerted in striking three or four notes helps to develop the muscles concerned. It is necessary to acquire the "sense" of the vibrato first, and the more rigid the fingers, the better; this rigidity is better secured by giving the fingers something to do than to leave them held up, unoccupied and in negative contraction, as they would be in playing octaves. Furthermore, octaves entail a certain stretching of the hand, and unnecessary strain of this kind is an impediment in learning a new technique.

Any chord which meets the above conditions will serve this purpose. Chords of the 6th, or any form of the Dominant 7th (without the octave), are the best to take. They should be practised first with a double percussion, and then a triple and quadruple one. Then repetition should be undertaken, and gradually expanded to a continuous movement, with the recurring impetuses of the upper-arm muscles, to the limit of physical and nervous endurance. Gradually as the muscles develop, effort will become reflex, and fatigue correspondingly less.

The execution of continuous passages in octaves, such as the 6th Hungarian Rhapsody of Liszt, is carried out in the same way as the repetitive passages, but the movement is complicated by the necessity for lateral movement of the arm. If, however, we bear in mind what was said in the chapter on Rotation, wherein it was demonstrated that lateral movement resolved itself into a rotatory movement of the elbow-joint in one plane, and of the wrist-joint in another, the question of combined movement can be solved. In the example:

---

[1] This theory is developed further, and is even more striking, in the consideration of its application to control of groups of finger actions.



the hand starts at the low position of accentuation: the next three notes are rebounds (vibrations) executed by the wrist, while the forearm is rising upwards, both to reach the black note B flat, and to get a new impetus from a high level on the 5th semiquaver: the elbow also starts from a low position and describes a concave course in order to arrive at the same point: the second bar is an example of the static, repetitive form of the movement.

In summing up this form of vibrato, it must again be pointed out that the vibrating mechanism (in this case the wrist and forearm) is set in motion by vigorous contraction in the upper-arm: these muscles in their turn are kept moving in their recurring impetuses by the shoulder muscles (the deltoid and pectoral), and the lateral movements are controlled by the pectoral and dorsal muscles. From this it follows that the farther back the strain, the better for the moving parts: and the more the arm is kept moving, the greater is the freedom of movement, and the farther away the likelihood of stiffness and fatigue.

Finger-vibrato.

The other form of vibrato is that which deals with the execution of passages in single notes. In this form, while the general principle is the same as that of octave passages, the details, owing to dissimilar conditions, are different. In dealing with wrist vibration, we had only one vibrating member: in finger vibration, we have five, none of which has occasion to rebound on itself directly, but in alternation with the others in almost endless variety. As a result, it is possible to set the finger muscles in contraction and keep them vibrating by their own muscular tension. At the same time, the impetus to these movements can be given by the forearm (just as the upper-arm did for the forearm in the foregoing octave discussion), and they derive an accelerated impulse to their own vibrations by this means, the more so since some of the finger muscles are themselves situated in the forearm.

The process is concerned with nerve movements and nerve pressure: it is therefore difficult to describe accurately. If, however, we grasp the fact that any swift vigorous muscular movement is not a matter of brute strength, but of nerve power[1] —that power which enables the brain to communicate its messages at the greatest speed, and, be it said, in a cumulative quantity—we may obtain a fairly clear idea of it.

It was said, in investigating the octave-vibrato, that the original impulse contained the vibrations: it will be better to state the matter in another way with regard to the fingers, and say that " the original impulse contains the subsidiary impulses, *i.e.* the finger-muscles are first " set " in contraction, and their kinetic action is released by the impetus of the forearm (or possibly, hand) impulse. The contractions can be of any number, within the limits of physical and nervous capacity.

A simple example is that of the trill with adjacent fingers. A trill is not made by separate movements of the two fingers. The student performing this trill, for instance, with the 2nd and 3rd fingers, will find, on analysing the sensations, that a certain fixation (not a baneful one) occurs at the roots of the fingers near, and on the other side of, the knuckle-joint. This is caused by the contraction of the interossei and lumbricales muscles controlling these fingers: the contraction is the result of the nervous effort made by the player.[2] This contraction can be maintained by nerve impulses directed towards it and renewing it.[3] Going a little further back in the analysis, it will be seen that the original vibration was set in motion by a " throw " of the forearm. This throw need not necessarily be a visible, or even a physical, action : very often it is a " thrill " or " urge " of the nerves communicating directly with the contracting finger-muscles.[1]

---

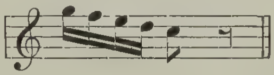
[1] See p. 139, para. 5.

[2] This corresponds to the double contraction of the brachialis and triceps; see footnote, p. 58.

[3] This is a form of cultivating inward physical sensation mentioned in Chap. V, p. 68.

Naturally the first efforts at a trill must be effected by separate finger-movements, in order to secure " right movement," but as strength and control develop, the two movements blend and arrive at a state of continuous nervous tension, until the impulses become automatic and reflex in their co-ordination and are set in motion by a single impulse. There is no reason why an equally brilliant shake should not be produced by any other two fingers, provided the same process is followed and adhered to with sufficient determination.

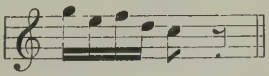
Another example is that of " drumming " with all five fingers on a table, or on the keyboard. Any fairly competent pianist plays a passage like this :



almost unthinkingly in one impulse.

He does not make five conscious finger movements : he has the whole set of impulses prepared by one combined contraction or fixation of the finger-muscles concerned, and the whole is set in motion by, either, the " throw " of the forearm, or the nervous " thrill " already described. In fact, the former should contain the latter. Long indulgence in the habit of doing this has caused the action to become reflex. It is another good example of the control of a group of reflex actions.

If he had made a habit of playing this figure :

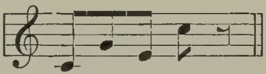


he would have obtained equal facility in executing this more difficult passage. It is difficult only relatively to the other. The difference lies in the fact that he naturally attempts to play the second example with separate finger actions, instead of grouping his actions in one nerve impulse, as in the first figure. The faculty of contraction in playing the first figure has come to him unconsciously through incessant repetition. Knowledge of the physiological and nervous facts would have expedited the result in both cases. In the second figure, he should concentrate on achieving the necessary contraction of the whole group of muscles required, together with the nervous preparation for the movement of alternating fingers: then by deliberately practising the *group*, instead of the isolated movements, he would achieve the result much sooner, at greater speed, and, given right movement, with equal certainty.

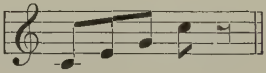
---

[1] The practice of exercises in uneven notes (*e.g.* dotted quavers and semiquavers) is an admirable way of developing this power of nervous speed. The use of such exercises has for long been an important part of the methods of the great Continental teachers.

The same remarks apply to the execution of arpeggio passages, and the kindred broken chords. The ordinary broken-chord passages such as:



should not present any greater difficulty than the almost nonchalant:

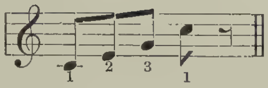


if played, as already said, with the requisite physiological knowledge and preparation.

The playing of double notes is merely a development of the above practice, and any prolonged passage may be divided into groups which will lend themselves to this "vibrato" treatment.

In the playing of extended passages, such as scales and arpeggios through several octaves, the principle of combination and co-ordination must be applied, in so far as it concerns the entry of lateral movement of the arm. The problem of "thumb-under" may even be solved in this way. In swift passages of this kind, the thumb-under action can be made by such a lateral movement.

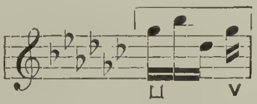
In the passage:

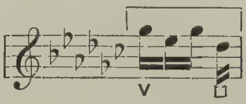


the first note should be attacked by a muscular impetus in the upper arm which contains in it not only the finger movements 1, 2, 3 but also the lateral movement of the forearm from 1 to 1 (C to C). *It may reasonably be said that the thumb has begun to move under before the first note is struck at all.*

Investigation of any prolonged passage will show that it can be divided into groups which can be treated with one impulse in this way.

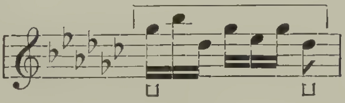
The following is an example: Chopin's Study in G flat (black-notes), Op. 10, No. 5.

1. 

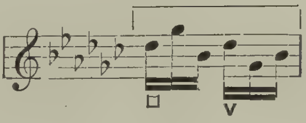
2. 

Observe the marks for wrist undulation.

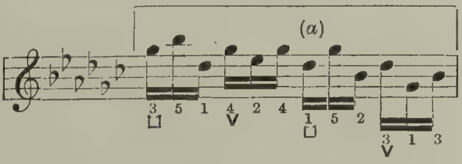
Merging both into one impulse, we have:



Continuing again with:



we can ultimately merge the whole bar:



into one impulse, including in it the lateral readjustment of the arm to take up the new position at (*a*).

Enough has been said to show the possibilities of this very highly developed form of technique. If we accept the fact that the impulses *contain* the vibrations, we come inevitably to the conclusion that the muscles during vibration are acting in a reflex manner, and that this action must be nervous and not altogether muscular. This also throws further light on the question of relaxation. Impediment to speed and freedom is generally due to undue stiffness and straining of muscular movement *throughout* the passage : the acquisition of the faculty of renewing muscular impulses alternating with relaxation is the antidote. It is clearly of advantage to hold the hand in a state as near to relaxation as possible, during vibration : it is even possible to concentrate the impetus itself into one infinitesimal moment of time, that moment being the one of the point of contact of the big muscles concerned. These remarks form a corollary to the concluding remarks in Chapter VII, concerning the " bridge " between physical and absolute relaxation : the vibrations form a bridge (or gap) during which resilience is in operation, and preparation for the next impulse is being made.

It is obvious that this form of technique cannot be practised until the science of right movement has been mastered. It is equally obvious that without this form of technique the swiftness and brilliancy of the virtuoso are unattainable. It must be realized that the practice of it entails great physical and nervous effort. It corresponds to that extra spurt of speed which the great athlete can call upon himself to produce in a great race : or to the extra effort of concentration which places the great thinker, scientist, or philosopher above his fellows : it is, finally, based on the power and rhythm[1] of inward physical sensation that is latent in every human being, which every great artist cultivates and calls upon when great effort is required. It requires vision, determination and endurance, but when it has been mastered it will lead him to the goal of effortless reflex action which leaves the spiritual faculties free to express themselves unimpeded by the trammels of too great physical exertion.

---

[1] See Appendix I.

CHAPTER XII

GENERAL SUMMARY

It now remains to gather together the details which have been examined in these chapters, and to attempt a statement of the solution of the problems with which they are concerned.

The general conclusion to be drawn from them may be thus stated :

Technique must be primarily a matter of muscular and nervous training. The old teachers were right in their insistence on the definite and separate training of the fingers and wrist action: their methods, not their principles, were at fault ; the methods failed so often because they were based on an incomplete knowledge of the application of the general laws of physiology and also of the mechanics of leverage. Their failure to realize the use of the weight of the arm was also the result of such incomplete knowledge.

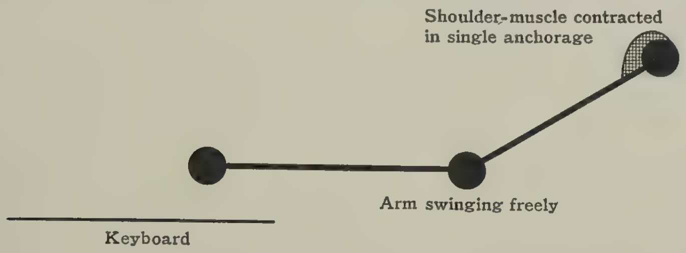
The modern methods of application of the weight of the arm constitute a step forward in the direction of tone-production: and the theory of relaxation is equally a step forward in the direction of greater freedom and suppleness. But in the desire to eliminate the stiffness of movement and thinness of tone of the old methods, the modernists have gone too far ; they failed to see that the real cause of stiffness was not so much the finger-action or wrist-action as the continuous fixation of the arm which confined action to the fingers and wrist, and immobilized the use of the weight and freedom of the arm. To go to the other extreme, and base the technique on the free swinging of the weight of the arm, and only using the fingers and hand as props for that weight, is as subversive of freedom as the stiffening of the arm in order to use the fingers and wrist alone. The fact that muscular effort is the basis of technique is sufficient proof that separate action of the parts of the arm (fingers, wrist, forearm, and upper-arm) and the shoulder is necessary. All these parts of the muscular equipment have their flexors, extensors, their abductors and adductors, which are intended for active, not passive use.

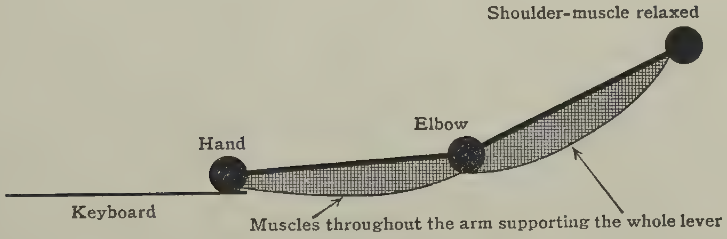
The foundation of the application of weight rests on the principle of anchorage or fulcrum outlined in Chapter III, and dealt with in detail in other chapters. Actually the real anchorage in a comprehensive technique is the body itself, swinging from the hips, this being, as it were, the parent anchorage. The anchorage which is most frequently in use is that from the shoulder : when this is not in free use, it helps to fix the upper arm when that in its turn is being used as an anchorage for the forearm : and so on to the fingers themselves. These weights (of the body, arm, and parts of the arm) are brought into play, first, by the muscular energy necessary to swing them, then by the gradual relaxation of the single anchorage and the swinging of the energy on to the double anchorage, at the point of contact, of the two ends of the lever with which it is intended to impart energy.

The amount of tone is regulated by the amount of weight, and the varying amount of energy imparted to that weight by muscular power. This means that energy is being exerted and *controlled* throughout the arm (or part of it, as the case may be), and that the muscles, once their function as manipulators of the levers is completed, transfer their operations to the helping to support the weight and taking up the resistance at the point of contact, securing, by their resiliency and perfect timing, a beautiful tone, very far removed from the dull thump which ensues from a falling dead weight or a vicious blow.

The diagram opposite is an illustration of this transference from the single to the double anchorage.

This question of anchorage is capable of wide variation and expansion. In finger work, the anchorage is generally in the hand. The measure of tone is then dependent on the weight of the hand, and the capacity of the muscles for varying the power of that weight up to the limit of their power. Finger action, however, may, and very often does, begin with anchorage of the hand, and then at the point of contact, the anchorage, in addition to transferring itself to the other end of the lever, also shifts itself back into the forearm or even the whole arm. This results in imparting the whole weight of the arm to the culmination of an action which began with the finger action alone, without having to lift the arm at all. This process was mistaken by the old masters for finger-strength, whereas it is finger-strength reinforced by arm-strength. If the student will make the following experiment, he will see the proof of this :





Place the arm on the table, the arm from the elbow downwards resting in a relaxed state, the fingers resting in a position for striking the keyboard. Raise one finger (any one will do) and then strike the table forcibly with it. The arm will instinctively spring upwards in recoil from the force of the blow.

Now repeat the process, but this time keep the arm firmly fixed on the table. The arm, held down by weight and muscular strength, will not recoil, but will nevertheless convey its strength to the finger, the latter "joining-up" with it in its fixation at the point of contact.

The first part of this experiment gives a visible demonstration of what takes place in the second. It is possible from this to understand the idea, inculcated by the old teachers, of keeping the arm still during finger-action. They merely made the above-mentioned mistake of imagining the blow to be caused by finger-strength—and so making the finger exert itself muscularly more than necessary. Their aim was undoubtedly that of avoiding the upward jerk of the arm which was bound to ensue unless the arm were fixed. Their ignorance of the use of the weight of the arm led them to overlook the fact that this fixation was only needed at the point of contact and that the elbow was really the fulcrum of the finger blow: before and after that point the arm should be left to move freely towards, and away from, that fixation. Their successors, in abolishing the fixation altogether, and making a fetish of relaxation, went to the other extreme, and allowed the free movement of the arm to be paramount at the expense of finger action; the result was the abandonment of the not inconsiderable power of agility of the fingers, with the consequent access of the untidiness, and lack of brilliancy and clearness so often prevalent in the playing of the majority of their students. The same remarks apply to the question of wrist-action: the wrist should operate from its own single anchorage, with its own free muscular movement: its own weight is often sufficient, in swift passages, to produce the necessary tone, and the use of reinforcing arm-weight can be called in as occasion requires.

To return to the fingers. In all swift passages for the fingers, where strength is required, the anchorage, whether of forearm or whole arm, may be maintained practically in a permanent though flexible state of fixation, capable of being eased (or broken) and shifted *en bloc* by the undulatory movement of the wrist—but sufficiently controlled to prevent any involuntary upward jerking of the arm above alluded to. The fingers should still fulfil their own function as fingers, moving unimpeded from their own anchorage, and should therefore be capable of swift and clear articulation: the vital factor is that, as each finger takes up the reinforcement of the arm on contact, the succeeding finger should be swinging freely and unimpeded from its own anchorage in the hand preparatory to performing its own work in its turn. This is the *raison d'être* of the exercise given in Chapter X. In this exercise the whole arm is swinging on the stationary finger, which means that the double anchorage is in action, one part at the shoulder, and the other at the finger end (the stationary-finger position being, so to speak, a permanent though fluid " point of contact " for the purpose of this exercise); the succeeding finger swings on its own anchorage and the double anchorage transfers itself to that finger at its point of contact. In all swift playing this swinging of the anchorage of the arm must be held in what may be called flexible fixation[1] so as to allow of the free movement of the fingers, especially in repetition action. For instance, if a given finger, when it has struck the key, has too much weight on it, due to over-pressure (or too great a departure from the level of resilience), it must obviously take time to recover from the over-balancing, with the consequent loss of agility, and possible impediment to the other fingers. It must not be forgotten, however, that nervous impediment is more often the cause of difficulty than physical impediment, the sense of balance being as much nervous as physical. The faculty of swift action must be cultivated, and also that of swift re-action: and this can only be done by clear realization of the physical conditions.

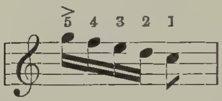
A word here may be said concerning the " vibrato." It has been described in Chapter XI as far as description of such an intricate physiological and psychological process can be described. It is fairly certain that the condition there defined as " vibrato " is caused by the fixation of the deep fascia of the muscles concerned, this fixation being, if not caused, at any rate assisted by larger muscles governing the smaller ones. Whatever it may be, experiment and constant practice will show that whole groups of notes may be played by one strong, *all-inclusive* muscular and nervous impulse: the feeling is one of strong fixation in the muscular region concerned (in the upper-arm in octave playing, for instance: in the forearm for the fingers, and so on), though, as practice goes on, this fixation becomes less strained and more under control: and its ultimate mastery results in what may be called, for want of a better term, "knack."

---

[1] In reality this is another form of resilience at the point of contact. It may be defined as a movable point of contact, the elbow acting as a periodically recurring fulcrum.

The "anchorage theory" may also be brought into use in dealing with vibrato. The following examples will serve, not only to illustrate this, but also to make more clear the necessarily recondite theory of "flexible fixation" given above.

Example 1.



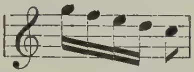
Using the wrist as the anchorage (and holding it still by fixation of the forearm) raise the hand on the wrist, and in its descent, "throw" it on to the keyboard, "catching" it on the first note of the above passage (with the 5th finger): the remaining fingers should be already poised, ready to swing on their own anchorage (at the knuckle-joints); the impetus given by throwing the hand, taken up by the 5th finger, is passed on to the 4th finger, and to each finger in turn. All this, of course, takes place at prestissimo speed.

The theory is that the hand impetus is divided up among the fingers concerned: another way of describing it is to say that the anchorage of each finger "joins up" in its turn with that of the hand on the wrist; and, going further back still in the action, the wrist establishes its own anchorage with the already fixed one of the forearm.

Casual observation might lead one to believe that, once contact with the 5th finger was made, the anchorage of the wrist and forearm remained at that fixed point. Closer inspection will show that the pressure of the apparently fixed anchorage of the hand continues in a downward direction, in order to keep the energy moving into each finger.

The later teachers recognized the necessity for this continuous conveyance of energy to the weight behind each finger, and devised the rotatory movement (towards each finger) as a solution of the problem. But, as has been already demonstrated,[1] this entails the changing of direction of the energy. The true solution lies in the recognition of the fact of the "continued downward thrust." Here the "flexible fixation" comes into play; the next example will show this more clearly.

EXAMPLE 2.



Using this time the upper-arm as anchorage, raise the forearm (which takes the place of the wrist in Example 1), *letting the wrist hang loosely*. As the forearm descends, it is "caught" in the same way by the 5th finger. At this point the wrist is still in the "high" position, not having yet straightened itself out from the hanging position: it is sinking downwards all the time, however, thus carrying on in its action the original downward thrust of the forearm, until it reaches its own point of final fixation as the thumb comes into action. After this, the fixation relaxes through the undulation of the wrist.[2]

In Example 1, where the wrist itself unites its anchorage with the forearm on contact, this elastic movement is taken by the knuckle-joints of the fingers.

The whole arm can be used in this way, and the elbow joint, the wrist (this always plays the major part, owing to its better position for flexible movement), and the fingers can all be brought into requisition to balance and regulate the downward thrust.

It is now possible to state in a few words the theories of this book:

---

[1] See Chapter IX.

[2] The "continuous downward thrust" often *alternates* with a similar upward thrust (see Chapter VI), according to the position from which the original movement starts.

All movements start from an anchorage of some sort: the shoulder is almost always in requisition for this purpose; everything swings from that anchorage towards the point of contact where the resistance of the double anchorage takes place. To avoid stiffness, the flexibility of the joints, principally the undulatory wrist-movement, is brought into requisition to "ease off" the strain at the point of contact, and also to allow of the "flexible fixation" which enables the energy to be continuous. This flexibility, in its "easing off," is the condition which has been mistaken for relaxation, whereas it is the "bridge" which is used for the unimpeded preparation for the next impulse of the controlling muscles. Again, the gradual relaxation of the original single anchorage until the double anchorage is reached is not the loose and flabby relaxation that these later teachers would have us accept: it is the free, balanced, and controlled swing towards the point of contact where resistance and consequent contraction take place: the single anchorage (generally the shoulder) is being relaxed gradually, but the other muscles are busy preparing to perform their function of taking up the strain of contact. Finally, as all energy is directed vertically against the key, the use of the rotatory movement of the hand, at any rate in finger-work, is mechanically incorrect: only in special cases (given in Chapter IX) can it be of use, and even then—as in broken octaves, where the forearm rotates on the fixed anchorage of the elbow—the technical result is better and more brilliantly secured by the flexible fixation of the forearm, moving upwards and downwards,[1] constantly renewing the impulse.

Technique is, in the end—given a knowledge of the physiological and mechanical conditions—a simple matter of continuous mental application. After the above conditions, and their corollary of "right movement," have been established and brought under control, speed becomes only a question of swift mental and nervous co-ordination of all the factors concerned. "Vibrato" comes under the category of nervous and physical power and vitality—what has been aptly termed "personal specific gravity." The long hours of practice undertaken by the great players are not devoted to continuous mechanical repetition of physical movements; by far the greater time is spent in *rehearsing* the co-ordination of all the movements, the training of the mental and nervous swiftness right up to the point of reflex, subconscious, but at the same time, immediately responsive, action and reaction.

---

[1] All action, once the point of contact has been achieved, passes through that point, in the direction of, though not entirely achieving, complete relaxation, and this condition can only be properly achieved when this departure from the point of contact has been predetermined in the original initiating impulse. It has been demonstrated already that the "follow-through" is not the important factor so much as the *intention* to follow through.

CHAPTER XIII

SUGGESTIONS FOR TEACHING

It has been assumed throughout these chapters that the reader is already equipped with a working knowledge, not only of music in general, but of the keyboard in particular. Before giving a broad outline of training for those who are so equipped, a few suggestions are given here at the beginning of this chapter for dealing with elementary pupils.

Teachers are often troubled about procedure in the early stages of training of their pupils. Questions like the following are often asked :

1. Should the teacher use all these technical terms—arm-weight, relaxation, muscular attachment, etc., in the initial stages of training a young pupil ?
2. Should the teacher begin by telling the pupil about the mechanism of the instrument, and matters of that kind ?

The reply to the first question is this : If the pupil went to a doctor with a complaint of pain in the ear, would the doctor tell the child that it was suffering from *otitis media*, and dilate upon the catarrhal tendency of the inner ear ? He would be far more likely to tell the child that it was suffering from earache, and send it home with a bottle of olive oil and a syringe. He would have already diagnosed the trouble, however, through his knowledge of the conditions, and acted in accordance with that diagnosis.

This is also the business of the teacher. If he has knowledge of technical and physiological conditions, he will be able to diagnose the requirements of his pupil ; but he need not burden that pupil with a mass of indigestible jargon.

Question No. 2 may be met in the same practical way. The child sees in front of him a delightful looking thing which he knows will make nice sounds. His desire is primarily to be able to reproduce those sounds. The wise teacher will proceed forthwith to bring about that desirable result by making him feel and hear what is beautiful tone.

Technical matters such as are raised by these and kindred questions can be tactfully introduced in the course of things. *Solvitur ambulando* is a good maxim for the teacher in any branch of education: abundance of knowledge and faculty for teaching will always find a plan for laying a sure foundation for his pupils.

It will be remembered that it was pointed out in the second chapter of this book that technique was as much a matter of mental training (and more so in the later stages of development) as it is one of physical training: and this side, the mental, must be undertaken from the beginning. The two important ingredients for this are, Aural Training and Reading. Teachers are apt to keep these separate; in reality they are inseparable, each dependent on the other. The ear should be able at once to hear what the eye sees: to quote the paradox of a great musical educationalist: "The musician should hear with his eyes, and see with his ears."

The pupil should not be allowed to linger too long over the spelling stage—the painful groping from one note to another. He should be taught to take in groups of notes, to understand that music has words and sentences, as well as letters; and that, just as in conversation or in reading there are certain phrases constantly recurring, so also in music there are certain technical figures which form the backbone of its language.

The following is given as an illustration of how this may be done:

The teacher should select a simple piece of music for the purpose. He should tell the pupil to look at the first bar, not playing it, but endeavouring to hear it, and memorize it. After sufficient time has been given for the purpose, the bar should be covered over, and the pupil should attempt to play it. When this has been achieved, longer "sentences" can be taken, according to progress.

This practice not only trains the faculty for absorbing groups of notes quickly, but also forms the foundation of memory-training ; and a memory developed in this way will be the more reliable, in that it will be an intellectual, and not a mechanical one. It also prepares the pupil in advance for the practice of the control of groups of physical actions, represented in Vibrato. Obviously mental grasp of groups of notes must come before physical grasp of groups of corresponding actions.

In educating the quickness of the mind in this way, the physical speed will naturally become equally alert and swift ; for it is obvious that the speed of the nerves and muscles, given their adequate development, must depend on the speed of the mind controlling them.

Coming to the matter of actual technical training, the first question must be that of the position at the keyboard. In the light of modern knowledge there need be no controversy about this. It is generally established that the best position is that in which the forearm, from the elbow downwards, is exactly parallel with the ground, and at a level with the keyboard. This position is the best for achieving the point of contact, and for allowing the free play, upwards and downwards, of the wrist.

From the beginning, the pupil should be taught to understand the difference between muscular contraction and relaxation. In teaching this, the elementary laws of muscular action can be inculcated at the same time.

The following is an excellent way of teaching this :

The teacher should take the pupil's arm, holding one hand under the elbow, and the other under the forearm. He should then tell the pupil to "let his arm lie dead" in his (the teacher's) hands. The teacher can discover whether the pupil is doing this correctly by the feeling of the weight of the pupil's arm in his own hands. If the pupil is failing to achieve the desired result, the teacher should suddenly take away his own hands : the pupil will find that his arm still remains suspended in the air —not resting, as he may have thought. This will prove to him that he is holding his arm up by muscular contraction in the shoulder: if, on the teacher calling his attention to this, he will then drop it down, he will be able to realize that the dropping is caused by relaxing that contraction, and the teacher should take the opportunity of driving the lesson home. The teacher should persevere until the pupil can let his arm rest, fully relaxed, on the teacher's hands: having arrived at this point, he should then proceed to move the pupil's arm up and down in the shoulder-joint. At first the pupil will be inclined to move his arm in sympathy, through involuntary muscular impulse: and this must be eliminated patiently by the teacher. He should take care to draw the pupil's attention to the fact that these involuntary impulses are the result of inadequate command of the nerves controlling the muscle. Throughout this process, the pupil's forearm and hand should be made to hang loosely.

All this will be found to be not so difficult as it may seem: it is an infallible method of teaching the realization of muscular feeling, and, once this beginning has been achieved, it will be only a matter of time before control of other muscles can be attained in a similar way.

After this sense of control of the shoulder has been mastered, the process should be applied to the keyboard. The pupil's arm should be held at a point above the keyboard, and he should be induced to let it fall on to the keyboard, *irrespective of any particular notes.* (This practice may be carried out also on a table.) The teacher should then point out to the pupil that the falling arm is "caught" by the hand and supported by the flexing muscles of the forearm, and the triceps muscle in the upper-arm.[1] This will give him an idea of what is meant by point of contact, with all that that connotes (in the way of fixation, anchorage, etc.). By this time, it is assumed that the pupil can suspend his arm by his own muscular control in the shoulder, without the support of the hands of the teacher, and he should be reminded that here the arm is being supported by the "single anchorage" of the shoulder. As he relaxes his shoulder muscle, letting the arm fall, and at the point of contact supports it with the muscles of the under part of his arm, the teacher should demonstrate to him that he has transferred that single anchorage from his shoulder, to the entire length of his arm from the under part of the shoulder and upper-arm to the finger muscles themselves. This will give him the idea of having the anchorage from both ends of his arm—the "double anchorage."

---

[1] He need not use technical terms; visual and tactual illustration are often far more effective.

From this point, the pupil should learn to control the descent of the arm by *gradual* relaxation, and to time the complete transference of the anchorage to coincide with the point of contact. For this purpose, definite notes should be used, preferably a triad or first inversion.

All nervous tension on the part of fingers and hands, due to anxiety to strike the right notes, should be strictly forbidden: the control of direction lies in the guiding shoulder muscle: otherwise, the flexing muscles, being at tension, will not be resilient, and bad timing and hard tone will result. The tension of the flexing muscles, though being anticipated by nervous preparation, does not actually come into action *until* the point of contact, and *accurate playing depends on the determination and strength at that moment, not before it.* This is a most important point.

As soon as the pupil realizes the "feel" of the muscular process at the point of contact, the way to all the other details—use of the wrist, fingers, etc.—lies open, and the knowledge of the scientific facts of the question, or the guidance of a teacher who has studied those facts, will do the rest.

It is always best to begin with the whole arm, for several reasons. The muscle concerned, the deltoid, is a big one, and can be easily felt: the swing of the arm in the shoulder conveys the feeling of freedom in the hands and arms: the use of the weight is more easily realized when the whole arm is in play: and the feeling of balance from the shoulder anchorage, which is undoubtedly the basis of all technique, is grasped from the beginning.

The subsidiary questions of using muscular power to accelerate the speed of the blow, the separate use of the forearm, wrist, and fingers, etc., follow naturally upon a sound understanding of the main question.

Clear muscular action should be taught from the start. Finger-action, wrist-action, etc., must be definite, and, in the early stages of muscular training, vigorous. The bane of all such actions, as taught in the old systems of finger-exercises, has been ignorance of the conditions governing the stroke. All actions should be analysed and isolated as far as possible: in finger-action, for instance, the "raising" should be vigorous and free, unhindered by stiffness or rigidity of the other fingers: and the "lowering" should be equally free, swinging towards the real contracting effort at the point of contact, *past* that point into the "follow-through" or relaxation.

The choice of exercises is a matter for the discretion of the teacher. The question of what exercises should be used is not so important as the question of *how* they are used, with this reservation, that "moving" exercises are far more important than "still" ones, just as a runner practises running rather than fixed leg exercises. The analogy here, however, must be carefully weighed, because of the advocacy, in this book, of the use of gymnastics. It must be remembered that most people, by virtue of the fact that walking is part of their normal life, have a reasonable equipment of leg and body muscles for running: and these do not need a special course of building-up. In piano-playing such a course is necessary, because the muscles needed, though present in every normal organism, are in a low state of development, if not of complete atrophy.

The mention of muscles that are in use in ordinary life may be taken as an excuse for a digression here, in order to suggest a reason, and at the same time a remedy, for the weakness of the left hand. It arises from the delusion that only the fingers are used in piano-playing. If anyone be asked the following question: "With what action do you use a knife and fork?"—the answer will almost certainly be: "With the hands." And yet ocular demonstration will show that in that action there is a distinct movement, backwards and forwards, of the whole arm.

In the same way it will be found that with most pianists the arm, or at any rate the right arm, is moved about, however unconsciously, even in slight finger action. This moving-about is due to the fact that in the actions of ordinary life, such as the above instance, the arm is being constantly used to help the hand, though the fact is not always realized. When, therefore, the problem of the left hand has to be attacked, the ordinary student, naturally thinking that he used his *fingers* only in his right-hand work, proceeds to attempt to do the same with his left-hand fingers, using them without the help of his arm ; and he has not the natural instinct, which he had with his right hand, of letting his arm assist his hand, because of the fact that he uses his left arm so little in the ordinary avocations of life. The result is that he keeps his left arm still, striving to do all the work with his fingers.

In the five-finger passage, for instance, on page 119, it would be safe to say that 80 per cent. of students would play it in the right hand with an unconscious and natural undulatory flourish of the wrist, but in the left hand they would play it with timid finger-action only.

This is an instance of the value of accurate observation. The remedy in this case is to persuade the pupil to practise using the left arm to a greater extent in ordinary life. There are many things which can be done, such as winding a watch, swinging a walking-stick or umbrella, buttoning up a coat, and so on, without incurring the stigma of eccentricity. Practising the action of throwing is an extremely useful pastime, and, with due care in the choice of the missile, not dangerous : it helps greatly in developing the "flick" of the wrist which is so useful in Vibrato.[1]

All this would seem to be outside such an aesthetic accomplishment as piano-playing : but it is in the observation of such apparently trivial things that knowledge and its application are gained. In the matter of this left-hand problem, the muscles probably, the nerves certainly, are there, but the "sensing" of them, and therefore their adequate use, is wanting.

---

[1] See p. 111.

To return to the matter of direct training, the remaining recommendations apply to elementary and advanced students alike.

Muscular and nervous training and control are attained by slow and steady growth, due to continued daily application : and the knowledge of the physiological and mechanical conditions is all-important. For this reason, the gymnastic exercises of the type recommended in this book should be used daily, if possible morning and evening, until they become a habit, part of the daily routine of life.

The daily keyboard practice should embrace the exercise of all the different parts of the arm, separately and in combination : *every* branch of technique, octaves, chords, exercises in 3rds and 6ths as well as in single notes, should ultimately be embodied in the *minimum* daily practice—not carried to extremes, but sufficient to ensure daily technical food for every part of the hands and arms.

Exercises should be performed slowly with close attention to the question of "right movement" and realization of inner physiological conditions (muscular re-action, point of contact, relaxation, etc.) : and, when right conditions and movements are realized, they should be performed swiftly, with experiments in Vibrato.

Slow practice, as Schumann said, is golden : but only for the purpose of assuring right conditions, together with accuracy and clearness in the music itself. Thenceforward swiftness must be regularly practised in order to train the mind to move, the nerves to carry the message, and the muscles to respond, at the greatest possible speed necessary for the performance of the work. The ability to call on the muscles at the swiftest possible notice is the result of nervous power. The gymnastic exercises should be practised in this swift way, after the ability to assume the right positions has been attained. It is this nervous power which forms the real Vibrato.

As already stated, this kind of practice calls for tremendous vitality and determination, and indeed physical strain : but only by developing in this way the specific gravity of the personality and character of the student can the highest achievement be reached.

The author recommends the following as a pattern of daily routine at the keyboard. Their order is not to be taken as rigid: but it will be found advantageous to take the shoulder and arm exercises first, because they undoubtedly help to strengthen and invigorate the other parts of the arm, and even to loosen the fingers by the freedom of swing.

(1) Slow scales (or any technical exercises) in double octaves, with attention fixed on full arm movement, using the whole weight with flexibility between each action.

(2) Moderately fast octave passages with wrist-action alone (in order to develop muscular power in the wrist). Prolonged passages, like those of Isidore Phillip, are excellent for this purpose.

(3) Chords and octaves, with undulatory movement of the wrist, carried up to Vibrato speed.

(4) Finger exercises,[1] preferably a few scales and arpeggios, with the action described in Chapter V (page 62). At first the finger action should be practised slowly with the movement of the wrist shown in the illustration. This will develop the feeling of swinging the anchorage of the forearm and arm from one finger to the other. As practice goes on, and inner "sensing" develops, this wrist movement may be reduced to infinitesimal dimensions and finger work may be taken in groups. From this point swiftness begins, and Vibrato passages may be practised with impulses, constantly renewed, of the whole arm.

(5) Skips, in Octaves and Chords, in order to develop the lateral movements of the arm. These must be practised with a swinging action, the whole arm moving in the shoulder, and not being checked until the actual point of contact. There must *never* be any checking movement to steady the hand just before striking any chord (as if there were a fear of striking wrong notes). Primary action not secondary, must always be aimed at, even at the risk of wrong notes. Certainty will come with practice, as

---

[1] Shakes, between each adjacent pair of fingers, and in double notes, should be an essential part of everyday work, as helping to develop the faculty for Vibrato.

it does with any aiming practice at other things besides piano-playing.

In this daily practice, the attitude must be purely technical, not aesthetic. The student must, for instance, in (1) think of the movements and function of the shoulder muscles: in (2) and (3) of the forearm-wrist muscles, and in Vibrato of the "set" (or fixation) of the upper-arm muscles: in (5) of the muscles of the chest and back which move the arm laterally. This introspective practice will help the student to secure right movement. After a time the movement will become subconscious; but, in daily routine practice, at any rate, the introspective *control* should never be lost sight of, lest faulty habits creep in.

Similarly, in grappling with technical difficulties in any work which is being studied, the movements of the fingers or arm, as the case may be, which are required, must be analysed and co-ordinated, and then practised introspectively and under control, until they in their turn become almost reflex and subconscious. Passages mastered in this way will be found to have real permanence, such as can never be attained by mere blind repetition.

Every action, whether single, as in single-chord playing, or in groups as in passage work, must be conceived in the mind and communicated to the muscles concerned. Once this conception is determined upon, the movement must be carried right through, without a check, but always, of course, under control, to and beyond the point, or series of points, of contact. Any check interferes with freedom of thought and movement. The whole physical conception of the particular movement must be practised repeatedly until certainty and accuracy are attained. The analyses of passages in Chapters X and XI and in Appendix III can be taken as instances: the analysis of the different movements and conditions once having been made and determined upon, they must be practised as one whole movement which contains in itself the smaller details. All the parts may be good, but the whole must be practised: the "ship must find itself." Determination and, above all, relentless concentration are required: it is only out of the possession of such qualities that great pianists are made.

A word should be said for the use of gesture. While unnecessary and aimless wavings of the hands and arms (and particularly the fatuous pirouetting on the fingers indulged in by some performers) are to be deprecated, it is nevertheless true that emphatic gesture and movement can be a criterion of thought. No one can deny that the sudden stiffening of the whole body which comes to the true artist, who feels, for instance, the thrill of the opening of the A major Polonaise of Chopin, is the very result of that thrill ; such indulgence in physical response makes the effect much more dramatic than if it were merely executed in a cold, pedantic manner. But the gesture must be part of the technique, not outside it : technique is, in the end, the physical means of expression of thought, and the two should be inseparable.

A little more is needed in conclusion. Nothing has been said about expression, varieties of touch, or style. The whole art of expression depends on the mind and character of the performer, conveyed by means of his technique. He needs only a little imagination who would see that varieties of touch and tone depend on the varying applications of speed and power in the act of touch itself. No jargon is necessary, nor peculiarities of attitude or gesture : the control of the physiological apparatus is sufficient for all purposes. The rest is a matter of general aesthetic training, which is outside the scope of this book.

The question of the use of the pedal is equally extraneous to the purpose of this work, except in so far as the physiological side of it, the training of the co-ordination of the hands and the feet, is concerned. The art of pedalling requires a deep study in itself : it is too subtle, and dependent too much on the musical sensitiveness of the performer to be adequately dealt with in writing.

It has been said in its Preface that this book is intended to be a scientific treatise. The progress of pianoforte playing and teaching has advanced enormously in the last twenty-five years ; knowledge of the subject has developed to the point where there can be no room for any particular method, and the time has come for technique to be regarded as a science. It may be that this book will help, however imperfectly, to establish such a science on a definite basis. This, at any rate, has been its purpose.

When all is said and done, the human factor still remains—the unassailable rampart against mechanical perfection. It has already been said elsewhere in this book that there still remains the great field to be explored by the new science of Psychology. It may be that future teachers will be able to analyse the minute and intricate nervous organisms of the arms and hands, and harness it in such a way as to shorten the present prolonged period necessary for the attainment of nervous control. Whenever and however such a result may be achieved, it must be based on scientific facts, and not on any personal idiosyncrasy of one authority or school of teaching. Scientific principles are, *ipsis factis*, things which are known and established : the method of teaching them depends on the personality of the teacher, not on any panaceas which are his alone. Finally, it will be found, if musical history be read accurately, that, just as the great pianists of the world are such on account of their own inherent greatness, and not because they were pupils of any particular school, so the great teachers have been what they were because of their genius for instruction rather than because of any particular method which they taught.

CHAPTER XIV

THE PHILOSOPHY OF TECHNIQUE

THE subject of interpretation has been studiously avoided in this book. At the same time, the incidence of technique and interpretation can never in the end be separated.

Technique, material as it appears to be, is bound to become an actual part of aesthetic feeling. There are many who will hold that technique is not everything, and will go so far as to say that they prefer a good interpretative effort with inadequate technique, to a skilful technical performance without a great interpretative effect. It is, perhaps, a question of degree. Perfect technique, with convincing interpretation, constitutes a counsel of perfection, they say. The obvious reply is that we must " hitch our waggon to a star."

There are some of us, however, old-fashioned enough to argue that a good interpretation is impossible without adequate technique, and that technical lapses are apt to cause discomfort sufficiently to detract from the fulness of spiritual inspiration which the interpreter may wish to convey ; and, further, to argue that, after all, interpretation is an abstract thing and open to criticism ; whereas perfect skill and craftsmanship have at least the merit of being concrete and satisfying. The tendency towards the subordination of technique to interpretation—and we have been, and are, passing through such a phase, not only in executive, but also in creative work—is a very dangerous one, and it is bound to reduce any art to mere dilettantism. The critical faculties, already blunted to the finer shades of craftsmanship, must inevitably also become blinded to the subtleties of artistic interpretation.

The case against the scoffers hardly needs arguing. Every language, to be intelligible, must have its grammar. If a speaker, for instance, chose to use any jumble of words, without grammar or syntax, but at the same time addressed his hearers with some emotion and dramatic feeling, his interpretation might be perhaps emotional; but he would be quite unintelligible to his audience, who would perhaps dimly recognize that he was expressing some great thought, and possibly be even regretful that they could not share it. To carry this argument a few degrees further, it may be said that even if the speaker used intelligible language, he would still be less convincing and clear than if he were able to use also a cultivated literary style. It is not enough for his hearers to say, in a vague way—"I can see what he is driving at": for full conviction it is necessary to be able to say: "I understand." Sincerity is the more convincing when great art (which is the result of continual and arduous practice, a thing in itself, a developer of character) is brought to bear on its expression.

So is it with musical interpretation. It is so obvious as to admit of no controversy, that, given two artists of equal interpretative power (so far as such a faculty can be catalogued), the one with the more accomplished technique will achieve the greater result. The other aspect of this argument, that, given two artists with equal technical power, the greater interpreter will be the more convincing, is not really an opposite aspect, but only another way of stating the same thing: because, in both cases, we are dealing on the one hand with technique as a measurable and tangible quantity, and on the other, with interpretation, which is an abstract quality. And even then, when we say that technique is a tangible thing, we are on dangerous ground when we come to the question: "What is Technique?"

Technique can be defined as the acquired skill in physical craft which an artist brings to bear in expressing his own spiritual individuality. To many people, technique is mere mechanical execution, the display of brilliant fireworks. We often hear it said that such and such a player has a wonderful technique—a loose statement, unless a definition of its meaning is given. If the statement means that the artist plays all the notes perfectly, and, when necessary, perhaps sometimes when unnecessary, at tremendous speed, it is at least an appreciation of the artist's wonderful skill. If it is made in a sense derogatory to the player as an artist, it is a condemnation of the artist, not a condemnation of technique.

Technique is not the mere acquisition of the power to do acrobatic feats on the instrument. When the foundation of technique has been laid, when the artist has acquired control over his physiological means and mastered the problems which all schools are generally agreed upon as necessary for adequate technical equipment, he has still to adapt that foundation to his own interpretative needs and to make his own technique. It has to become part of his own physical and spiritual nature: the two are inseparable, and indefinable as to their frontiers. One hears people say, for instance, that Pachmann's technique is not so wonderful as Rosenthal's. This is again a question of point of view. Pachmann's technique is adapted to express himself, an ethereal, albeit often elfish and wayward, embodiment of charm and poetical imagination; Rosenthal's is used for the expression of a vivid, swift, sometimes brusque, but always fine and dignified mind. Both succeed in achieving the expressive result they are searching for, and in that sense the technique is, in both cases, wonderful.

A certain fine artist, a friend and fellow student of this writer, used to say, in spite of the possession of executive powers of no mean order, "I have no technique," much to the astonishment of some of his fellow students. This artist has a peculiarly beautiful charm in his playing, the expression of a fine artistic mind: he is what the Germans call a *feiner Musiker*. He was well aware of his inability, with all his mechanical executive equipment, to express that charm, and he was occupied in polishing and refining that technical equipment of his until he had controlled it and made it beautiful in consonance with his own desire for adequate expression.

One hears so often the unthinking remark that " far too much attention is paid to technique." The reply to such a remark must always be : " There can never be too much attention paid to it." The greater attention paid to technique, and the greater the skill brought to the performance of great works, the greater is the light thrown on their endless underlying potentialities. Further, the more the possibilities of technique are explored, the wider is the field opened up to future composers ; it is in this way that the resources of the art itself are expanded and developed.

The writer once heard a great painter criticizing the work of his students, and commenting on their lack of draughtsmanship. " When you see a lovely effect, in a sunset for instance," he said, " how can you put that effect immediately on your canvas, unless you have sufficient drawing technique to expedite matters before the effect is gone from you, perhaps for ever ? "

The great interpretative artist has moments of exaltation when he would fly to undreamed-of heights of inspiration. Will he not achieve these heights with so much the more superb success, if he be not hampered by the clipped wings of inadequate technique ?

How supremely right was that old master who said that the three things the artist required were—Technique, *Technique*, and TECHNIQUE.

APPENDIX I

RHYTHM

The study and cultivation of physical rhythm must necessarily have its effect on the study of musical rhythm: for this reason, although it may appear to be outside the scope of this book, comment is needed on the distortions of rhythm which are indulged in still by pianists in their so-called interpretation of the Romantic composers. This is especially the case with the playing of the music of Chopin, who has always been the chief sufferer in this respect.

The term "rubato" appears to have been first used by Chopin, and he explained it, as also did Liszt in his *Life of Chopin*, literally to mean "rocking the time" (a general and rather loose translation, and one which has been one of the main causes of the abuse of it); in practice, it was used to induce a departure from rigid metronomic playing, and to bring punctuation and, as it were, inflection (as in the recitation of verse) into the rhythm of music. This is the natural outcome of the effort to bring freedom and humanity into the art of interpretation: it is the result of the realization that rhythm, while preserving its swing and verve, is capable at the same time of flexible treatment within the bounds of those inherent qualities.

If one listens to a recitation of poetry, one finds that, although the punctuation, with its subtle pauses, may be meticulously observed, lines hurried here and there, the voice raised and lowered, yet these apparent aberrations from metrical correctness are, in the hands of a competent artist, very subtle, and in no way an intrusion on the general rhythm of the whole. One feels the swing of the verse, and is never allowed to forget that it is poetry, and not eccentric prose, that is being recited. Similarly, in the interpretation of music, it is possible to make subtle pauses, to hurry or retard the time without impairing the general sweep of the rhythm: but if these subtleties are exaggerated into eccentricity, such sweep is lost, and the music is consequently marred. And yet, in spite of constant protests on the part of serious artists, this practice of exaggerated rubato still goes on, depriving the music of Chopin of its great dramatic significance and romantic simplicity, to such an extent that no one is considered to be an interpreter of Chopin unless he *does* indulge in this practice. For this, the critics are largely to blame: either they are obsessed with the craze for "individuality," or they have become so accustomed to hearing Chopin's music "pulled about" by the numerous inferior artists whom they are unfortunately compelled to hear, as to have lost the faculty of sensing the subtlety which underlies his work. It cannot be gainsaid that this subtlety needs the utmost delicacy of treatment if it is to be effective, and, furthermore, it can only be acquired, paradoxically enough, by the deep study of classical music, especially in the interpretation of the slow movements of Mozart, Beethoven, and Brahms. These movements, with their adherence to the atmosphere and technique of either the string quartet or the orchestra, require a knowledge of that type of music, with all the meticulous attention to detail (especially in quartet playing) which is necessary in order to bring out its underlying beauties. The application of this classical spirit to the romance and emotionalism of Chopin's work will not only enhance the intrinsic musical value of the playing, but will also serve to reveal the true rhythmic beauty of his music. Chopin's music is, in itself, intrinsically "rubato," and the subtlety of detail referred to above, when applied to it, acts as an intensifier, as it were, to the natural elasticity inherent in his rhythm.

There are many fine pianists who have the faculty of bringing out the simple romance in Chopin's work who have been condemned as poor Chopin players: and there are also many others, with much less technical competence, and with much less refinement and delicacy in their musical equipment, who have been praised as good Chopin players because of a habit of eccentricity which to a real artist is merely distortion, but to many people passes for " interpretation."

It has already been said that this battle has been fought for years. It will continue to be a bone of contention until a real study is made of the rhythm and balance of things seen around us in Nature, of the same qualities in physiological action, and the application of the acquired knowledge to the art of interpretation.[1]

Finally, in concerted music, whether of the chamber or orchestral variety, one never hears these terrible distortions, even in the interpretation of emotional composers like Tschaikowsky, and Romantic composers like Debussy. Quite apart from the difficulty of making a large body of individuals indulge in such eccentricities in concert, there seems never to have been an instance where it has even been attempted. And yet we have widely differing interpretations of these works by different conductors and different quartets. Is it not possible to apply these same principles to the individual ? Surely it should fill him with a feeling of greater responsibility ; it is so much easier for him to indulge in licence, and he should therefore be the more preoccupied in avoiding it and studying the subtleties of real freedom in rhythm.

---

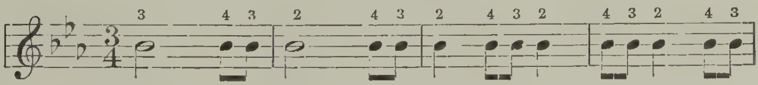
[1] There is a well-known simple psychological experiment which illustrates this. A metronome is arranged so that it beats at absolutely regular intervals, but with every third beat (let us say) louder than the other two. An unprejudiced observer is then asked whether he thinks that the beats occur at regular intervals of time, and it is found that he supposes that the accented beat comes before its time. This is perhaps one of the reasons why it is so disconcerting to have to play in exact time with a metronome. In rhythmical playing, the bars (or perhaps even small groups of bars) should each last the same time, but the duration of the beats which make up the bar have to vary slightly from regularity as the same emphasis does not come on each beat (*Voice Training*, by W. S. Drew, p. 63).

APPENDIX II

FINGERING

The science of fingering has not kept pace with the changes and developments of the science of technique. Fingering that was suitable, indeed necessary, to the old style of still-hand technique, is very often inapplicable to modern methods: further, the continued use of this old-fashioned fingering has frequently been the cause of slow progress with these methods. The freer use of the arm, and the vibrato method of technique, calls for the alteration, and in many instances the abandonment, of these old methods. Particularly is this the case with repeated notes and chords. The old teachers would never approve, for instance, of the player using the same finger in repeating any note; this was reasonable from the point of view of restriction of arm-movement and the maintenance of exaggerated finger-action.

A specimen of old-fashioned fingering is shown in the following example, the opening passage in Chopin Valse in E flat:



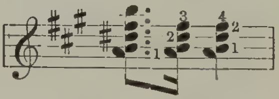
This was the only possible fingering under the rigid technical conditions prevalent in Klindworth's day, with its system of a fixed wrist and elbow. It is obvious, however, that the amount of tone produced in this way is a limited one, and even so, the maximum tone was secured at the cost of great tension and strain on the hand; and further, the risk of inaccuracy was always present owing to the absence of firm anchorage at the moment of contact.

The solution of such a problem as this had nevertheless been already found by Bülow, who, in the opinion of most people, would seem to have been the personification of pedantry: yet, in his edition of the Appassionata Sonata, he makes the revolutionary suggestion that the repeated notes (in the left hand, 1st movement) should be played with one finger alone, obviously calling for a vibrato use of the wrist. This certainly makes for greater accuracy, and, moreover, secures a better effect. If this method be applied to the passage quoted above, and to similar passages (such as the opening of the Valse, Op. 34, and the Valse in E minor, Op. posth.) greater power and certainty will result.[1]

It should be said, however, that in very quick repeated notes, such as those found in bravura passages like the Campanella Study and the Rhapsody No. 13 of Liszt, the alternating finger method is better. The valse in E Flat of Chopin, quoted above, has a passage in such repeated notes (where the key changes to A flat) which may be played either way, though the Bülow way is safest.

Another instance will be found in the first three Variations of Beethoven's 32 Variations in C minor: here the Bülow method gives a much broader and bolder effect than the flippant one which ensues from the use of the old-fashioned method.

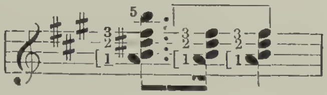
The habit of changing fingers on all repeated notes has been carried to absurdity by Klindworth and his followers in the fingering of repeated chords. A flagrant instance of this occurs in the fingering of the Polonaise in A major.



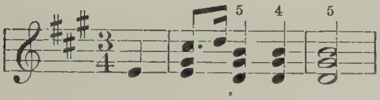
Anything more awkward to play than this it is difficult to imagine, especially when the result is correspondingly ineffective. Such a fingering is the more astonishing when the alternative, played with a "whip" of the forearm and making use of the resiliency of the key, is so very easy and undeniably stronger and more dramatic.

---

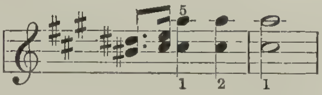
[1] Many players go so far as to use the thumb and middle finger together for such a passage as this, and with fine effect.



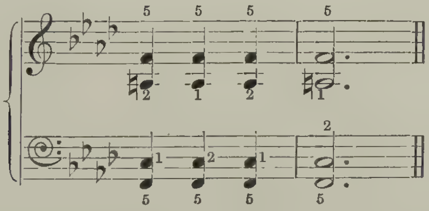
Changing fingers on notes seems to have been an obsession with this editor. He does not even let the simple A major Prelude (Chopin) alone in this respect. His fingering for this is:



and



He may possibly have had in mind the fingering at the end of the F minor study of Liszt, in the Dannreuther edition. Dannreuther, in a footnote, comments on this fingering. "The fingering shows one of Liszt's ways. It was in accordance with Chopin's practice in similar cases of sustained sound, a sort of 'Bebung.'"



It may have been that such a fingering aimed at producing a certain peculiar quality of tone, viz. a kind of "portato," using the swift re-action of the key to produce continuous tone.[1]

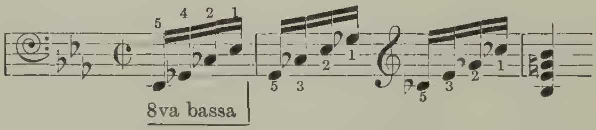
To say, however, that this fingering produced this kind of tone is a palpable instance of confusion of cause and effect. The tone produced is caused by the swift return of the key, and in those days of rigid arms and fixed hand anchorage such swiftness was possible only by using the changing fingers: but with modern methods, speed and better tone can be achieved without such clumsy devices.

---

[1] This also may have been in Klindworth's mind in his fingering of the Prelude: but Klindworth's methods in other passages, *e.g.* in the Polonaise quoted above, tend rather towards an obsession with a "school" of fingering than towards a desire for artistic effect. His ludicrous pedalling marks are another proof of his unthinking pedantry and lack of understanding. It is necessary to be fair, however, and to admit his skill and ingenuity in finding fingerings for difficult passages; a fine instance is his fingering for the G sharp minor Prelude, and, to a lesser extent, of the G major Prelude.

Another aspect of fingering has been opened up by Brahms' method of fingering arpeggios. In this he rejects the old-fashioned method of putting the thumb under: he carries each "block" to the full extent of the hand, ending on the 5th finger, and then swinging the hand laterally to the next position. He gives examples in his 51 Studies, evidently with a view to guidance for similar passages to be found throughout his piano works.

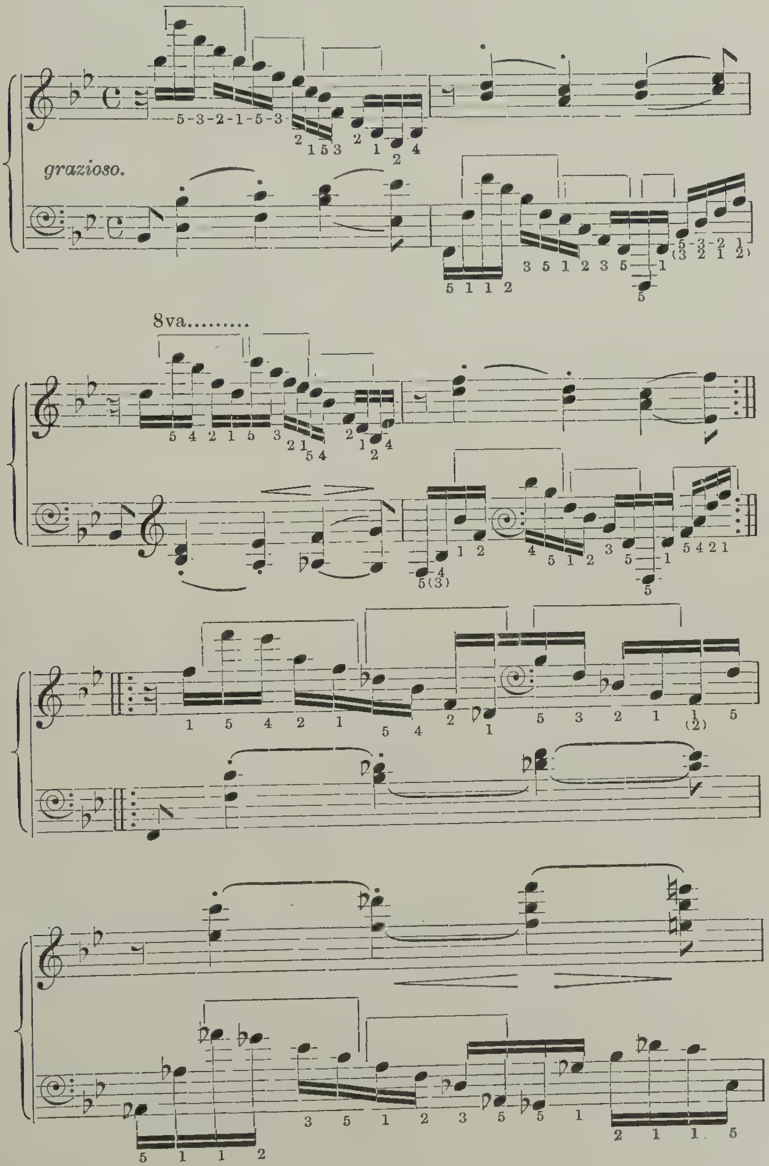
With modern methods of technique this is quite easy of attainment. An excellent example, and a very effective one, is that of the fingering of the left-hand arpeggios in the Rhapsodie, Op. 119.

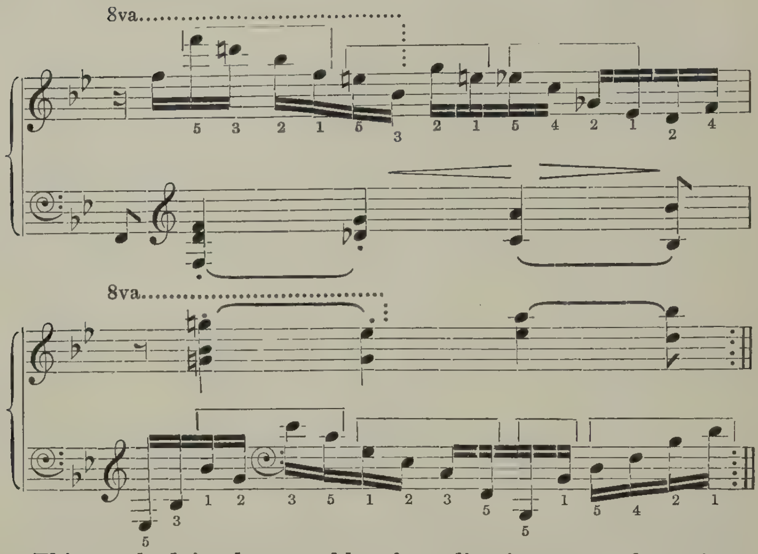


With a skilful use of the pedal it is possible to obtain a very good legato with this fingering, even in slow playing, though it is obviously more suited to brilliant passages. Instances of the former use will be found in the Romance in A major, Op. 118; Intermezzo in E flat minor, Op. 118; and Intermezzo in C major, Op. 119.

In spite, however, of Brahms' plainly defined ideas in this direction, it would seem that there is still a lack of knowledge and perception of their importance. A particular instance of this occurs in Variation 18 of the Brahms-Handel Variations. Here the entire harmonic structure, and the necessity for its clear exposition, call for a fingering in accordance with Brahms' ideas: and yet in no edition known to the writer has this Variation been fingered correctly. The Variation is here given in its entirety with the only possible fingering.

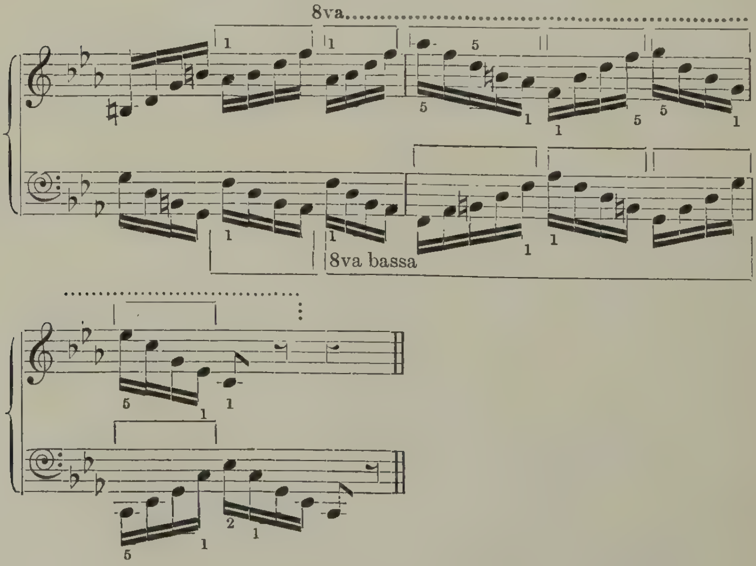
Brahms-Handel Variations No. 18.





This method is also capable of application to works written before Brahms' time. One instance is given here, where its use can effectively solve a difficult technical problem, and, incidentally, add more point to the rendering of the passage in question.

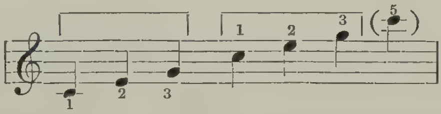
Beethoven's 32 Variations. Var. III.

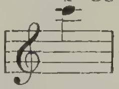


This method does undoubtedly obviate much of the over-use of the thumb-under and finger-over movement which, closing up the hand as it does, interferes with the free movement of its complicated muscular mechanism. It has already been demonstrated in this book that the hand moves more freely and with greater suppleness if it be carried in a " floating forearm " and maintained in as open and flat a position as possible.

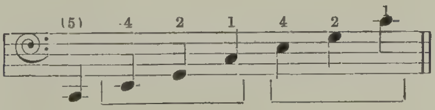
It may be useful here to point out a factor in arpeggio-playing which may have been overlooked by many teachers and students. It may be called the analysis of the " framework " of arpeggios. It applies chiefly to common chords, but is applicable also to arpeggios of the Dominant 7th. It is based on the fact that the 5th finger is used only as a convenience in these arpeggios, and plays no important part in the design of their fingering. An illustration will make the point clear.

(1) Right Hand



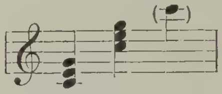
In the above example, the 5th finger does not appear until the last note, and then only as a convenience : for if the arpeggio were to be extended, the thumb would come on the . The fingers used are 1, 2 and 3, and the notes covered by these form the " framework." On the 4th note the hand moves laterally to a new position embodying the same three notes an octave higher, and the 5th finger is only used to end the sequence.

(2) Left Hand

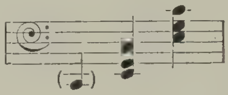


Here the arpeggio begins on the 5th finger, and this finger does not again occur till this same note is re-encountered. Ignoring that note, it will be seen that the framework begins at E, and consists of E, G, and C, and the hand shifts, as in the right hand, to a similar group an octave higher.

Thus it will be seen that the arpeggio consists of a series of "blocks" of notes, in the Right Hand, of :



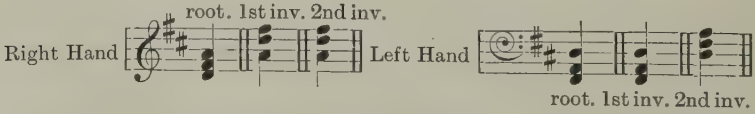
and in the Left Hand of :



If the arpeggio can be visualized in this way, and played with a succession of lateral swings of the arm, leaving the fingers free to perform their function within each framework, the result will be the attainment of greater speed and brilliancy. It may be objected that this method will prevent smoothness in passing from one octave to another : but to an unprejudiced observer, watching and analysing the movement of the great players, it will be obvious that they do *not* indulge in the awkward method of laboriously bringing the thumb across and under the hand in the way in which it has been taught.[1]

Every arpeggio, whether in the root position or in an inversion, can be treated by this "framework" method, and the framework can always be found by playing any three notes which do not include the use of the 5th finger.

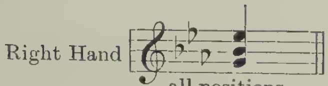
In the case of arpeggios with no black notes, or with one black note, the framework varies according to the position : but where there are two black notes, the framework is the same through all the positions. For instance, the framework of D major is as follows :



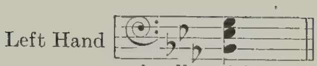
---

[1] It must be clearly understood that the thumb-under movement is not being condemned : on the contrary, it cannot be dispensed with ; but it must be used in *combination* with the lateral swing of the arm, and not as an end in itself. The latter only results in the arm being carried on the thumb in the transition to the next position, instead of the arm carrying the moving thumb within its own lateral movement. See Chapter X.

and of E flat:

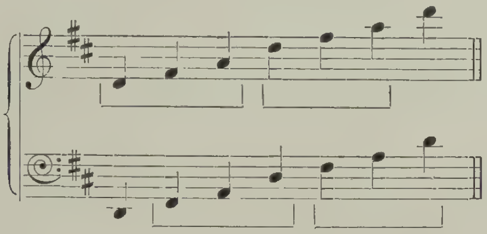


all positions.



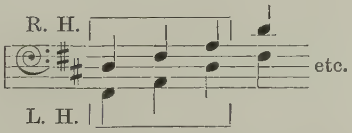
in all positions.

An examination of any arpeggio will reveal the fact that the frameworks of each hand are never together. In D major, root position, the paradigm of the two hands is as follows:



This is a very important factor to be grasped. Many students have an idea that the hands remain parallel in arpeggio-playing: but an inspection of the above example will show that such is not the case. The hands move parallel for the first three notes, and then the right hand moves away from the left while the latter is completing its framework; and, on the 5th note the left hand moves towards the right, which is stationary, and occupied with the completion of its own new framework. The lack of observation of this peculiarity is often the cause of slow progress, if not of inaccuracy, in this branch of technique.

It may be suggested, as a corollary to this, that the best way to study arpeggio-playing is to practise them in such a way that the frameworks always come together.



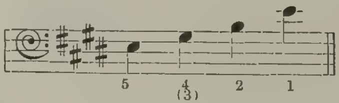
The objection to this, however, is that the mental complication involved is too great in the early stages. That it is useful for more advanced players is undeniable: and if the proper perspective of the arpeggio be placed before the student in the beginning, the difficulty, in the later stages of playing examples like the one given, will be considerably modified.

The question of rhythm will also arise. It may be objected that this method would confine the rhythm of arpeggios to groups of 3, and would cause irregularity in the playing of arpeggios in groups of 4. The solution of this difficulty lies in the proper use of the undulatory movement of the wrist, as outlined in Chapter VI. The following example for treatment is given as a suggestion.

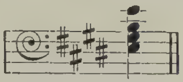
In the 3-grouping (in the right hand), using the arpeggio of C major as an example, the wrist should start at a level with the forearm, and then raised (arched) through the next two notes, ready to be depressed again at the fourth note, where the accent occurs. In the left hand, it would be better that the wrist should begin somewhat lower than the forearm level, and rise through the 2nd and 3rd notes to reach the accent *at the top of its arch*, making this accent with a forward thrust of the arm. As the 4th finger comes over to take up the new framework, the wrist should be depressed again and the same process followed. In the descending passage, each hand will perform what the other performed in the ascending passage.

The playing of 4-grouping can be carried out in a similar way: but it is suggested that here the accent should be made, in each hand, with the wrist at the top of its arch, with the arm thrusting behind it. This position renders it so much easier to obtain a good accent, since the note accented most frequently occurs on a finger, which lends itself so much better to a forward accent, and not on a thumb, the natural position of which almost always requires a low-wrist position.

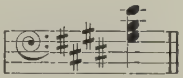
The following point should be observed in connection with this subject of frameworks. It deals with the question of fingering for such a passage as this:



Some players advocate the 3rd finger rather than the 4th on the G sharp. If the chord is visualized thus :



then the 3rd finger is easier : but the fact is overlooked that the 5th finger is a convenience, and that, after that finger has played, the hand is not again in the same position, but assumes the position of the framework, viz. :



If this chord is played, it will be found that the use of the 4th finger is the more comfortable. Hence it follows that this finger is the better one to use for the arpeggio.

This method of finding the framework (which is really a finger grouping) applies also to scales in their groupings of 1, 2, 3 : 1, 2, 3, 4. It is especially useful in dealing with scales (and also arpeggios) which begin on black notes. It is generally conceded that any finger-grouping which begins on the thumb is always more certain of control than one which begins on a finger. The physical structure of the hand, the conditions of grip, etc., account for this, and these factors would be taken into account in those scales which begin on fingers instead of the thumb.

For example, in the scale of F sharp major (Right Hand) the first note, beginning on the 2nd finger, is the second of a group of four notes beginning with the thumb on E sharp. When the scale is started on F sharp, it is generally played in a gingerly fashion, owing to the absence of the sheet-anchor—the thumb : but if the experiment be made of beginning on E sharp a feeling of grip and confidence ensues.

Again, in playing the arpeggio (Right Hand, root position) of E flat there is a less amount of confidence than in playing the first inversion. The former begins with the second (or 4th), and the latter starts boldly with the thumb. Yet the former has the same framework. This is a proof that the mental, indeed the psychological, attitude, is the main factor to be considered. If, in playing the above scale and arpeggio (and any other similar examples, the framework be first ascertained, and then the whole scale or arpeggio visualized from that point of view, the feeling of timidity will disappear, and these apparently difficult exercises will be played with the same boldness and swing as those which, while seeming easier, are only so on account of their beginning at once on their frameworks.

Investigation on these lines will repay study : the suggestions given with regard to the positions of the undulating wrist in the different groupings, which positions must necessarily vary in accordance with the exigencies of the passage under consideration, need not be taken as arbitrary, but simply as a guide : but the other points have to do with the question of the " topography " of the keyboard, and a sound knowledge of this is essential if many technical problems are to be mastered.

APPENDIX III

SOME EXAMPLES FOR STUDY

The following examples are given as illustrations of the method of working outlined in this book.

The general points to keep in view are :

1. The actual static technical difficulties These are such as need definite muscular practice with a view to training the hands and arms. They consist generally of exercises invented to meet given problems of technique, such as those suggested in Examples 1 and 2.

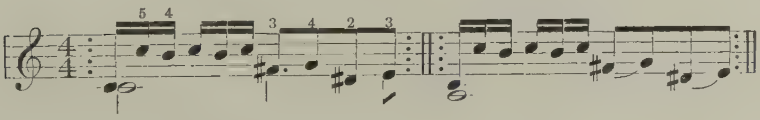
2. The actions entailed in combining such exercises in kinetic movement, as in Examples 3, 4 and 5.

3. The practice of making a general survey of a given passage or series of passages.

The daily technical exercises suggested in Chapter XI should cover general muscular training, and, ordinarily, the equipment thus gained should be equal to the problem in hand : but daily practice deals with the general, whereas these instances, given as specimens of difficult passages in the piece under consideration, deal with the particular.

EXAMPLE 1.

Isidore Phillip. (Exercises Journaliers).



The thumb is held down, not by great pressure, but sufficiently to support the weight of the arm. This holding down forces the hand to remain in the flat position so as to get the proper articulation of the 4th and 5th fingers from the knuckle-joints, and not in an oblique, so-called rotary movement.

At the same time, the thumb should not be rigid: it should be a flexible pivot, so as to enable the weight of the hand to be thrown on the 4th and 5th fingers in action. The fingers should not thrust (or "poke"), but should adopt a definite and decided finger-action, the weight of the arm coming into play at the point of contact. The flexors and extensors of the fingers are thus exercised, and the former take their part in taking the resistance at the point of contact. Observe that the 3rd finger, in playing the F♯, has to stretch itself away from the 5th finger, thus exercising the interossei muscles. The criterion here is a feeling of contraction on the index finger side of the middle finger, and attention should be concentrated on this. In the stretching towards the F♯ there is a feeling of strained extension on the 5th finger side of the 3rd finger. This is merely a *stretching*: it is *not a muscular contraction* in that region of the hand, and therefore all that part should be relaxed as much as possible so as to avoid any strain that may come from involuntary contraction.[1]

Observe that the 3rd finger holds down the F♯ while the 2nd finger plays D♯. This involves a *contraction* of the abductor muscles on the thumb side of the 2nd finger, and a *stretching* on the 3rd finger side of it.

Finally, in moving to E, the 3rd finger is again actuated by a contraction of the interossei muscles between the 2nd finger and itself. In the second part of this example, the F♯ is not held down: the whole hand is raised after the G, swinging still on the thumb, and carried towards the D♯, and raised again after the E in accordance with the phrasing.

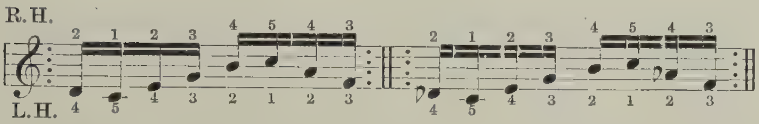
Detailed analysis of comparatively minute movements in this way, far from being pernickety, is of great benefit to quick and permanent mastery of any technical difficulty. The student should make a practice of getting down to details like this: he will save much time and energy that might be wasted in mere blind repetition.

---

[1] The faculty of distinguishing between stretching and contraction should be cultivated. The former is due to a contraction outside itself, and is in reality a relaxation.

EXAMPLE 2.

Brahms. 51 Studies, Nos. 8a and 8b.



This fine exercise in extension ought to form a regular item of a pianist's daily technical practice. It embodies all the movements entailed, for instance in playing Dominant 7ths, and is certainly more entertaining to practise.

It emphasises the chief difficulty in playing extensions, which is not so much that of stretching as of moving the fingers laterally.

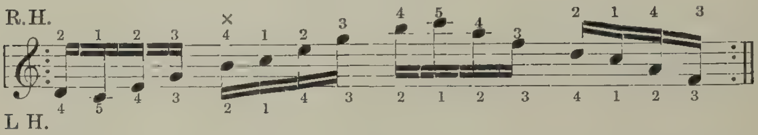
The 2nd and 4th fingers both move away from and towards (abduction and adduction) the middle finger, and the latter also moves both ways. Attention should be focussed on these movements throughout the exercise. The 2nd moves from D to E going upwards, the 4th from B to A going downwards, and the 3rd from G to F and back. The exercise can be varied by *holding down each finger* in turn until it is wanted again: this will then emphasise the lateral movements.

The second bar of the exercise embodies a greater abductory and adductory movement of the 2nd and 4th fingers, the former moving from D♭ to E and the latter from B to A♭, in each case an increase of a semitone in distance on those of the previous bar.

The hand should be kept *flat* and not be readjusted laterally by the arm: otherwise the point of the exercise, a training of the interossei muscles, will be missed. If this passage were part of a composition and were being prepared for performance, one would naturally seek for the easiest way of playing it, and lateral adjustment of the arm would be of great assistance for this purpose. Here, however, the outlook is purely one of technical training:

to attempt to find an easier way would be merely to lose its technical value.

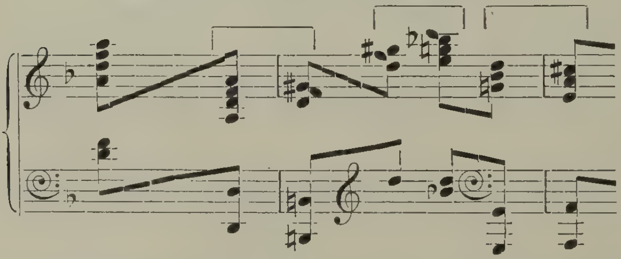
EXAMPLE 2*a*.



When the extension of this exercise is used (in its arpeggio form), this readjustment of the hand should still be avoided. As the 4th finger is playing the 1st B (marked ×), the arm should be *thrusting* forward (somewhat obliquely), in the direction of the C, the thumb moving with it: if the hand is to be rotated at all, it should not be done until the 4th finger has felt its fulcrum of resistance in its knuckle-joint. If the 4th finger strikes its note with the hand partially turned over, it will be unable to feel this fulcrum, the strengthening of which is the purpose of the exercise.

EXAMPLE 3.

MENDELSSOHN. VARIATIONS SÉRIEUSES.



This is an illustration of the use of the body in facilitating a technical difficulty. The passage is akin to that in Example 3, where a rigid central point was condemned and a wider movement was substituted.

This variation is often played with a jerky, snatching action, a darting from one side to the other, the lateral movements getting "criss-crossed," etc.

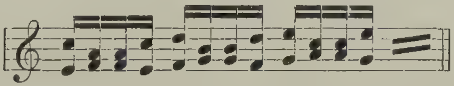
Analysis will show the way out:

Leaving Chord No. 1 for the moment, we find that Chords 2 and 3 are in the lower part of the keyboard, 4 and 5 in a correspondingly higher part, 6 and 7 lower again, and so on to the end of the Variation. The jerky action is avoided in this way :

The body is inclining to the left for Chords 2 and 3. On Chord 3 (not after it), the body should lean over to the right in preparation for Chord 4. This will anticipate the lateral movement from the left position, and it only remains to swing the arms when ready on to the position for Chords 4 and 5. The position having been established, as soon as Chord 4 is played the body can begin to move to the left again for 6 and 7. It will come about by practice that the body will swing in a regular rhythm of its own and the arms will adapt themselves to it. The whole movement then will be a series of graceful and easy transitions from one position to the other.

EXAMPLE 4.

TAUSIG. TECHNICAL STUDIES.



This is an exercise in undulatory wrist movement. It can be practised in several ways, of which three are given here :

1. ⊓V ⊓V, ⊓V ⊓V   2. ⊓V V⊓, ⊓V V⊓
3. V⊓ ⊓V, V⊓ ⊓V   4. ⊓V V V, ⊓V V V

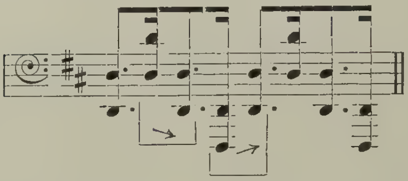
⊓ represents downward fall of the wrist, V represents upward thrust.

Though primarily a flexible-wrist exercise, it is useful, though not essential, to incorporate in it a pronounced finger-action, as an experiment in co-ordination.

Observe that the real action is that of the muscles in the upper arm and shoulder, which move the forearm up and down on a flexible wrist. At the beginning the arm is bent at the elbow : when the action is made this bend is straightened and taken by the wrist instead. The lower position of the wrist is brought about by the straightening thrust of the triceps muscle : the arched position is caused by the lifting upwards of the forearm by the brachialis and shoulder muscles. The sensing of these muscular actions should be cultivated, as well as the suppleness of the wrist and forearm, in practising this exercise.

EXAMPLE 5.

CHOPIN. IMPROMPTU NO. 2.

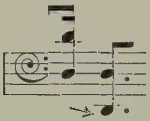


This difficult passage can be rendered easier by getting the correct mental perspective.

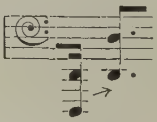
The first octave is almost always taken as the central point from which the other two octaves radiate. This generally results in spasmodic shots being made at the upper and lower octaves, the forearm being then at an oblique angle when they are being played. The right way to approach it is as follows. The 2nd and 3rd octaves should be "bracketed" together, and played with a lateral swing of the forearm (or whole arm) *away from* the body. The whole arm should then be carried down to the 4th octave, and a fresh start made from there, this time with the 4th and 5th octaves bracketed together, with a lateral swing *towards* the body.

In this way the performance involves two movements only :

1. The arm starting from the top and playing two octaves.



2. The arm starting from the bottom and playing two octaves.

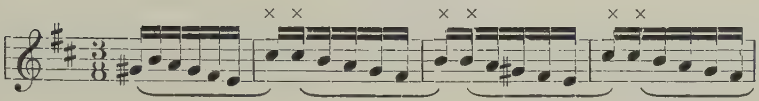


In between these two movements, the relaxed arm is carried by the shoulder to its different starting positions.

The brackets in the illustration show the grouping, the arrows showing the direction of each swing.

EXAMPLE 6.

SCARLATTI, SONATA IN D.



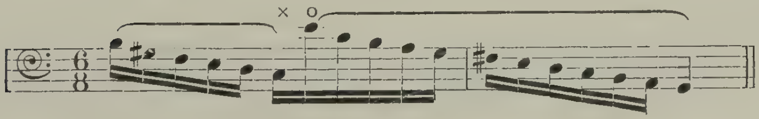
This is again a matter of mental perspective. The difficulty lies in the clear repetition of the notes marked × ×.

If the two notes are visualised as beginning their respective groups, the feeling of the necessity for repetition will be present, with the consequent possibility of "jamming" of that repetition. If, however, the passage be played according to the phrase marks, the difficulty will solve itself.

The wrist should be arched at the end of the phrase, and the first note of the new phrase played with the beginning of a lowering action of the wrist which culminates on the last semiquaver of the group. At this point the wrist prepares to arch again. This results in a continuous and free undulation of the wrist.

EXAMPLE 6*a*.

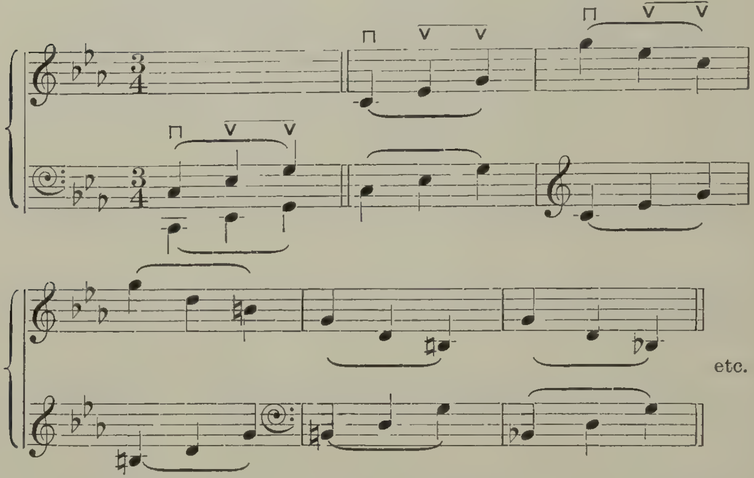
BEETHOVEN. SONATA OP. 27, NO. 1 (1st movement).



This passage requires similar treatment. The player is apt to visualise the jump of a tenth at ×, and attempt a spasmodic turn of the hand in doing so. The downward direction of the forearm towards × should not be checked till *after* the C at × is played: the arm should then be lifted, and the hand carried to a position from whence it can begin a new and similar downward movement on the next note (marked o).

EXAMPLE 7.

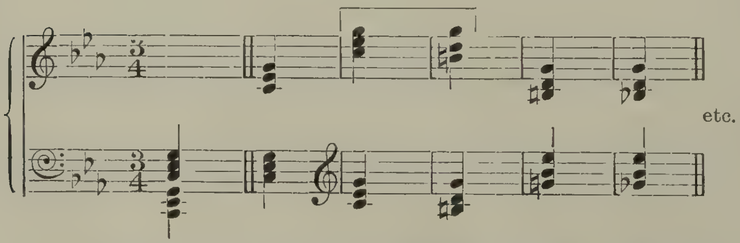
BEETHOVEN. SONATA OP. 27 NO. 1 (2nd movement).



The tendency here is to play the passage like an arpeggio. The phrasing points the way to the proper technical aspect.

The outline is :

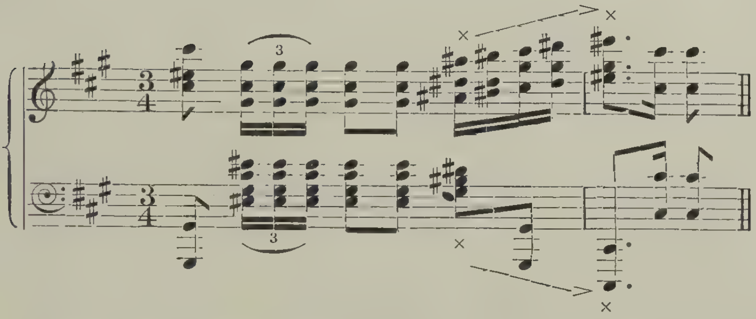
EXAMPLE 7*a*.



This "skeleton" form of the passage requires lateral movement of the arm at every new chord, except those in brackets. The original should be played with the same sense of lateral movement, the arm swinging from phrase to phrase, and containing within each swing, as it were, the three notes of each phrase. The phrasing is made more pointed if the undulating wrist be employed, as shown in the illustration. This is an instance of the proper technical outlook contributing to the finer interpretation of the piece.

EXAMPLE 8.

CHOPIN. POLONAISE OP. 23.



The triplets of semiquavers are an example of vibrato chord-playing. The impetus towards the first of the three should contain the second and third, the arms being held in fixation, with the wrist swinging freely, the descending impetus of the whole arm being actually completed on the quaver chord which follows the triplet.

The last two quavers of this bar and the first of the next give an illustration of the possibilities of co-ordinated movement. A passage of this kind is too often visualised, and played, as a succession of isolated chords, each with its own separate action. The liability to do so is not so probable in the Right Hand here, as the chords move quickly, and even a non-instinctive player might play it with *one* continuous forward movement of the arm, containing within it the lesser movements which play the individual chords, the arm impetus being at × ×. But the Left Hand chords, being slower, are almost always visualised wrongly, and are played with three separate actions of the arm. The resulting spasmodic movement merely interferes with the flow of the Right Arm action, and clumsiness ensues.

The remedy lies in using the Left Arm in the same way as the right. The three chords should be played with *one* sweep of the arm, with no "secondary" snap on the chords: the arm should, indeed, "bound" from one to the other. Thus both arms would be performing a lateral movement outwards, each swinging without spasmodic movement.

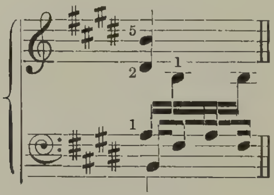
EXAMPLE 9.

Chopin. Étude in E major, Op. 10, No. 3.

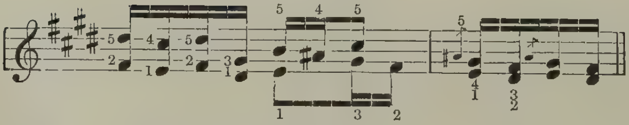
The first section of this study presents the problem of bringing out the melody above the accompaniment in the same hand. This is done by "fixing" the particular finger, which is playing the melody note, so as to "lock" it with the forearm. Its fulcrum will then be at the elbow (or even at the shoulder), and the extra weight and power will make the note more prominent. The remaining fingers should be trained to use their own fulcrum in the knuckle-joints. The difference of tone is thus secured by the difference of power-weight applied at the point of contact, and is better than employing differing *muscular* pressure with different fingers—an unnecessary complicated procedure.

The following are suggestions for fingering certain passages:

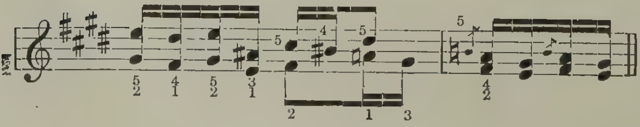
Bar 8, 2nd half.



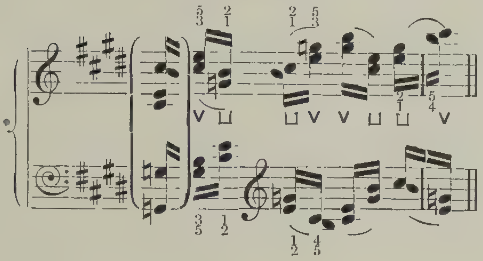
Bar 22 R.H.



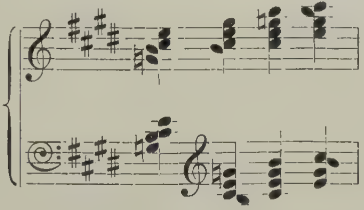
Bar 26 R.H.



Bar 32.



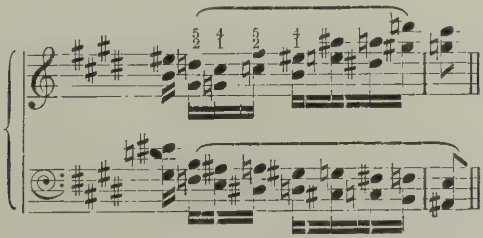
This presents the same conditions as in Example 7*a*, viz. the lateral shifting from one chord-position to another.



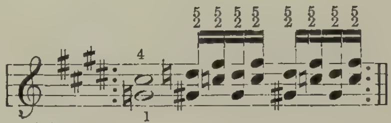
The passage should be played with alternatively arched and sunk wrist, ∨ representing the former and ⊓ the latter.

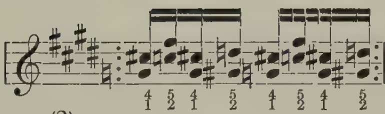
The attack should be by pulling down the arm at ⊓ and thrusting it upward at ∨. It should be observed that the second of each couple and the first of the following one have the same action ⊓ or ∨, and in almost every case the same fingering. This makes the arm-movement easier, as the arm only needs to be lifted up and lowered again between each couple, without the complication of a change of wrist-position. This is the technique, too, for the great passage beginning at Bar 46.

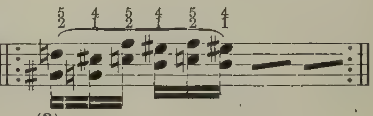
Bar 38, *et seq.*



The principal difficulty here is in achieving smoothness. Both hands have lateral finger-movement, but of a different kind in each. The Left Hand has the lateral movement involved in crossing the fingers over one another, which is part of the technique required for chromatic scales in double notes. The Right Hand presents greater difficulties. The study of the following technical exercises will show this: the lateral finger-movement is most pronounced in the case of the 2nd finger.

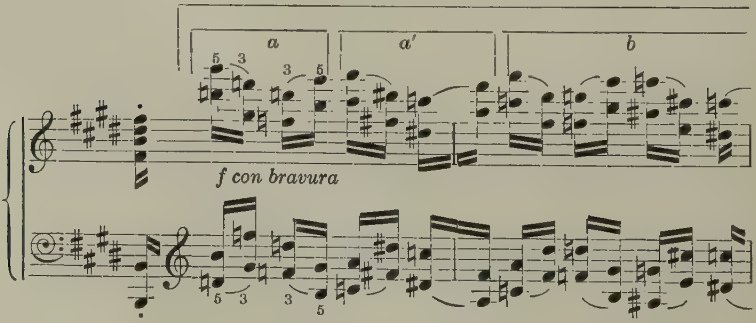

(1)

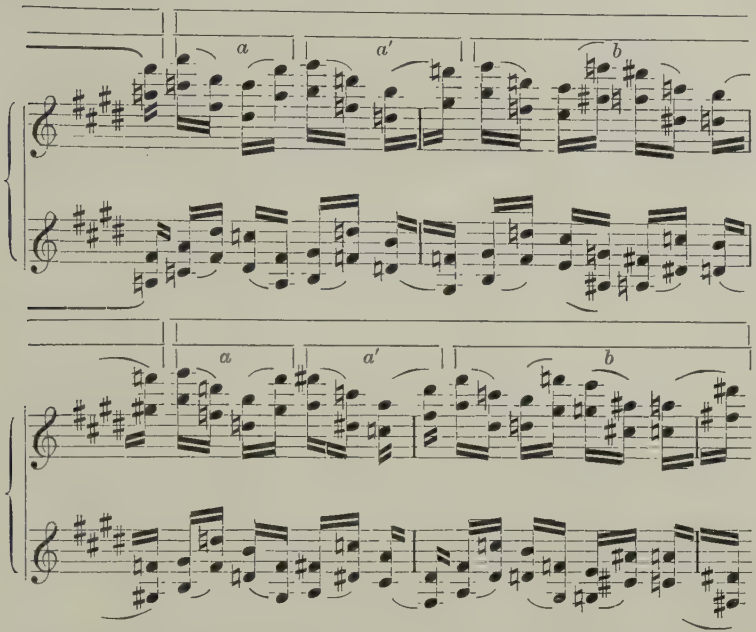

(2)


(3)

The left arm should be held in an oblique position, with the fingers pointing towards the left, so as to facilitate the passage of the 3rd and 4th fingers over the 5th. (The last two upper semiquavers in the Left Hand in Bar 41 are a tone apart, a departure from the chromatic sequence.)

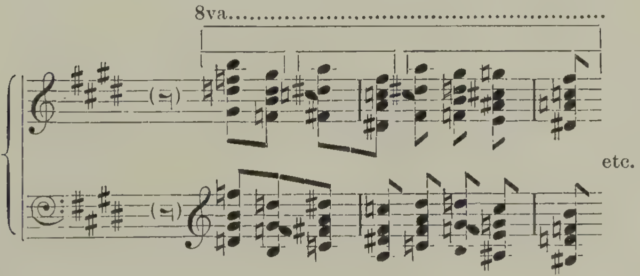
Bar 46.





Diagnosis will rid this formidable-looking passage of most of its terrors.

The following is a detailed illustration of its structure :



The harmonic construction is a series of chords of the diminished 7th. There are three large groups (indicated by the largest brackets in Bar 46) within which are corresponding smaller groups (indicated by smaller brackets). The following are memoriae technicae :

1. Chords in *a* and *a′* are inversions of one another, and those in *b* go in chromatic succession.

2. The first chord in the big brackets is an inversion of the last in the previous bracket.

3. The fingering is the same in both hands throughout the whole passage: and the first of each couple of semiquavers begins with the same fingers as the second of the previous one.

The technique is the same as that given under Bar 32. The whole arm should descend on to the first of each couple with arched and sunken wrist alternately. For example, the first of these chords is played with the arm descending on to the arched wrist, and the arm-impetus runs on into the sunken wrist for the second. The whole arm is then lifted, the fingers remaining in fixation into the next position, and the new couple is played with an upward "push" of the arm, beginning on the sunken wrist and finishing at the arched position.

BIBLIOGRAPHY

ALEXANDER, F. MATTHIAS. Man's Supreme Inheritance ; Conscious Control of the Individual. (Methuen).

AUER, LEOPOLD. Violin-playing as I teach it.

BREITHAUPT, R. M. Die Naturliche Klaviertechnik (C. F. Kahnt, Leipzig).

DREW, W. S. Voice Training (Oxford University Press).

FAY, MISS AMY. Music Study in Germany (Macmillan).

GRAY. Anatomy (Longmans, Fifteenth Edition).

HUXLEY, JULIAN. Essays of a Biologist (Chatto and Windus).

JAMIESON, E. B. Companion to Practical Anatomy (Frowde, Edinburgh).

KEITH, SIR ARTHUR. Engines of the Human Body (Williams & Norgate, 1919).

MACKENZIE, WILLIAM COLIN. The Action of Muscles (London, H. K. Lewis and Co., 1919).

MATTHAY, TOBIAS. Pianoforte Tone-Production (Longmans).

TOWNSEND, W. Balance of Arm in Pianoforte Technique (Bosworth and Co.).

WITKOWSKI, G. Atlas of the Hand.

PRINTED IN GREAT BRITAIN
BY ROBERT MACLEHOSE AND CO. LTD.,
THE UNIVERSITY PRESS, GLASGOW.

WORKS ON MUSIC

THE MUSICIAN'S LIBRARY

Musical Composition. A Short Treatise for Students. By Sir Charles Villiers Stanford. Extra crown 8vo. 6s. net.

Organ Playing. By Percy C. Buck, Mus.Doc. 4to. 7s. 6d. net.

The First Year at the Organ. By Percy C. Buck, Mus.Doc. 4to. 2s. 6d. net.

A Practical Guide to the Modern Orchestra. By James Lyon, Mus.Doc. Pott 8vo. 1s. 6d. net.

Interpretation in Song. By Harry Plunket Greene. Extra crown 8vo. 7s. 6d. net.

Chamber Music. A Treatise for Students. By Thomas F. Dunhill. 8vo. 12s. 6d. net.

Orchestration. By Cecil Forsyth, M.A. 8vo. 25s. net.

The Violin and its Technique as a Means to the Interpretation of Music. By Achille Rivarde. Extra crown 8vo. 4s. 6d. net.

Sir Hubert Parry: His Life and Works. By C. L. Graves. With Portraits and other Illustrations. 2 vols. 8vo. 30s. net.

Style in Musical Art. By Sir Hubert Parry. 8vo. 12s. 6d. net.

College Addresses. Delivered to Pupils of the Royal College of Music. By Sir Hubert Parry. Edited, with a Recollection of the Author, by H. C. Colles. Crown 8vo. 7s. 6d. net.

Foundations of Practical Harmony and Counterpoint. By R. O. Morris. 8vo. 7s. 6d. net.

MACMILLAN AND CO., LTD., LONDON

WORKS ON MUSIC

A History of Music. By Sir Charles Villiers Stanford and Cecil Forsyth. Illustrated. Extra crown 8vo. 10s. 6d. net.

Music and Nationalism. A Study of English Opera. By Cecil Forsyth. Extra crown 8vo. 6s. 6d. net.

The Threshold of Music. An Inquiry into the Development of the Musical Sense. By William Wallace. Extra crown 8vo. 6s. 6d. net.

The Musical Faculty: Its Origins and Processes. By William Wallace. Extra crown 8vo. 6s. 6d. net.

The Rhythm of Modern Music. By C. F. Abdy Williams. Extra crown 8vo. 6s. 6d. net.

The New Encyclopedia of Music and Musicians. Edited by W. S. Pratt. Illustrated. 8vo. 25s. net.

The Just So Song Book. Being the Songs from Rudyard Kipling's *Just So Stories*, set to music by Edward German. Music folio. 7s. 6d. net.

How to Sing. By Lilli Lehmann. Revised and Supplemented Edition. With Portrait and Diagrams. Extra crown 8vo. 14s. net.

The Savoy Operas: Being the Complete Text of the Gilbert and Sullivan Operas, 1875-1896. By Sir W. S. Gilbert. Crown 8vo. 8s. 6d. net. *Thin Paper Edition.* Cloth, gilt top, 8s. 6d. net. Leather, gilt edges, 10s. 6d. net.

Music-Study in Germany. From the Home Correspondence of Amy Fay. With a Preface by Sir George Grove. *Eighth Impression.* Extra crown 8vo. 7s. 6d. net.

Musings and Memories of a Musician. By Sir George Henschel, Mus.Doc. With Portrait. 8vo. 12s. 6d. net.

MACMILLAN AND CO., LTD., LONDON

Works on Music

THE MUSICIAN'S LIBRARY

MUSICAL COMPOSITION. A Short Treatise for Students. By Sir Charles Villiers Stanford. Extra crown 8vo. 6s. net.

ORGAN PLAYING. By Percy C. Buck, Mus. Doc. 4to. 7s. 6d. net.

THE FIRST YEAR AT THE ORGAN. By Percy C. Buck, Mus. Doc. 4to. 2s. 6d. net.

A PRACTICAL GUIDE TO THE MODERN ORCHESTRA. By James Lyon, Mus. Doc. Pott 8vo. 1s. 6d. net.

INTERPRETATION IN SONG. By Harry Plunket Greene. Extra crown 8vo. 7s. 6d. net.

CHAMBER MUSIC. A Treatise for Students. By Thomas F. Dunhill. 8vo. 12s. 6d. net.

ORCHESTRATION. By Cecil Forsyth, M.A. 8vo. 25s. net.

THE VIOLIN AND ITS TECHNIQUE AS A MEANS TO THE INTERPRETATION OF MUSIC. By Achille Rivarde. Extra crown 8vo. 4s. 6d. net.

SIR HUBERT PARRY: HIS LIFE AND WORKS. By C. L. Graves. With Portraits and other Illustrations. 2 vols. 8vo. 30s. net.

STYLE IN MUSICAL ART. By Sir Hubert Parry. 8vo. 12s. 6d. net.

COLLEGE ADDRESSES. Delivered to Pupils of the Royal College of Music. By Sir Hubert Parry. Edited, with a Recollection of the Author, by H. C. Colles. Crown 8vo. 7s. 6d. net.

FOUNDATIONS OF PRACTICAL HARMONY AND COUNTERPOINT. By R. O. Morris. 8vo. 7s. 6d. net.

MUSIC-STUDY IN GERMANY. From the Home Correspondence of Amy Fay. With a Preface by Sir George Grove. Eighth Impression. Extra crown 8vo. 7s. 6d. net.

THE SAVOY OPERAS: Being the Complete Text of the Gilbert and Sullivan Operas, 1875-1896. By Sir W. S. Gilbert. Crown 8vo. 8s. 6d. net. *Thin Paper Edition.* Cloth, gilt top, 8s. 6d. net. Leather, gilt edges, 10s. 6d. net.

LONDON: MACMILLAN AND CO., LTD.